TAMIL NADU AGRICULTURAL UNIVERSITY

TENTH ANNUAL REPORT

April 1, 1980 to March 31, 1981

CONTENTS

PAGE

1. INTRODUCTION 1

2. UNIVERSITY ADMINISTRATION 7

Officers of the University - Board of Management - Academic Council - Board of Studies - Board of Examinations - Research Council - Extension Education Council - Seminars - Campus Development.

3. TEACHING 39

Faculty of Agriculture - Faculty of Horticulture - Faculty of Agricultural Engineering - Faculty of Basic Sciences and Humanities - Faculty of Animal Science - Faculty of Fishery Science - Krishi Vigyan Kendras.

4. RESEARCH 64

5. EXTENSION EDUCATION 65

Training Programmes - Communication Centre - Plant Clinic Centres - Lab-to-Land Programme - National Demonstrations - Adaptive Research Trials.

6. FINANCE AND ACCOUNTS 73

7. APPENDICES

i) Research Highlights
ii) Important Visitors
iii) Schemes Financed by ICAR and other Agencies
iv) Books and Booklets Published
v) Scientific Papers Published
vi) Popular Articles and Jottings Published
vii) Number of Enquiries Answered, Cases Treated etc.
viii) Programmes Broadcast
ix) List of On-going Research Projects
x) List of Theses Submitted and Approved.

1. INTRODUCTION

The tenth Annual Report covers the period from April 1980 to March 1981. The achievements of the University in the spheres of education, research and transfer of technology during this period are presented in the report. This chapter, besides providing a background for these achievements, also identifies the tasks ahead. New degree programmes, both at the Bachelor's level and Master's level, were introduced. New research stations were started and the existing ones strengthened. Multipronged approach was followed in disseminating the research finding and in the transfer of technology from lab to land.

Education

... The following new department were started :

... Department of Nematalogy at the main campus

... Departments of Languages and Basic Sciences at the Fisheries College, Tuticorin.

... Department of Animal Husbandry at the Veterinary College, Madras.

... New degree programmes introduced are listed below :-

... B. Sc. in Home Science at the Madurai campus.

... M. Sc. in Sugarcane Production at the main campus.

... M. Sc. (Ag.) in Plant Pathology and Horticulture at the Madurai campus.

... Ph.D in Therapeutics at the Madras veterinary College.

... To improve teaching methods and standards a Workshop on Learning-Teaching was conducted.

Research

... Ten new crop varieties were released duting the year.

... CoH. 3 Sorghum

... Co. 5 Blackgram

... "Marutham" Tomato

ICAR Schemes

... Improvement of existing downy mildew resistant varieties of maize for yield and suitability for rainfed farming systems, Coimbatore.

... Development of isogenic, non - restoral pearl millet lines varying in sources for the genes, for resistance to downy mildew and testing at various locations. Tiruchirapalli.

... All India Coordinated Floriculture Improvement Project, Coimbatore.

... Improvement of Chicory, Coimbatore

... Standadrisation of hybrid seed production techniques in sorghum and bajra, Coimbatore.

... Study of the influence of climate on ontogenic changes in determining evapotranspiration and biomass production in sugarcane, Cuddalore

... Research on soil organic matter fractionation with reference to supply of nutrients, Coimbatore.

... Study of the causes and correction of chlorosis in crops like sugarcane, turmeric and jasmine, Coimbatore.

Private Agency Schemes :

... Research on integrated control of *Spodoptera* (*Prodenia*) *litura* on cotton and chillies (sponsored by Hindustan Lever Research Foundation), Madurai

Research Stations transferred to the University

... Thirtyfive research stations / sub - stations / schemes of the State Department of Agriculture were transferred to the University with effect from 1.4.81

The Paddy Processing Research Centre, Tiruvarur was transferred to the University with effect from 1.4.81

Research Thrust

The major thrust of research efforts was on the followicg :

... Development of new varieties of crops including forest and horticultural crops for different situations.

... Management of problem soil / water

... Utilisation of biofertilizers

... Crop management practices.

... Crop protection measures.

... Seed production and preservation techniques.

... Fruit processing techniques.

... Studies on alternate sources of energy.

... Design of new irrigation structures,

... Design of new improved implements.

... Breeding, feeding and management experiments in livestock to improve productivity.

... Identification of new varieties of mulberry and silkworms.

... Fish culture techniques

... Studies on adoption of new technology.

... Studies on risk behaviour of farmers.

... Studies on marketing of farm commodities.

... Operational research in water management, dryland farming, low-cost technology, integrated pest management and poultry disease control.

... Strengthening of regional research stations and sub - stations in different agro-climatic zones in the state.

... Organisation of seminars at national and state levels to bring about interaction of ideas in various disciplines.

Extension

The Directorate of Extension followed a multipronged effort in the transfer of technology from lab to land. Three hundred and seventy messages, based on the findings of the University, were disseminated, both in English and Tamil, through mass media like newsletters, farm journals and radio broadcasts. Enquiries from farmers, numbering 1870, were answered both directly and through the All India Radio. Radio talks numbering 102 were broadcast. Eight correspondence courses were offered and 550 candidates were enrolled. Fifty-four lessions were broadcast under Farm School on AIR Programme. Pest surveillance report was broadcast every week for the benefit of farmers.

The Farm Science Centres at Pondycherry and Tiruchirapalli imparted vocational training to farmers and farm youths and inservice training to extension staff of the Departments of Agriculture, Animal Husbandry and Fisheries. Rural surveys to identify the constraints in the adoption of new technology were also a part of the activities of the centres. The centres also provided farm advisory services to farmers under lab to - land programme. Villages were adopted for demonstretion of new practices. A National Tree Seminar was organised by the centre at Tiruchirapalli.

The Directorate of Extention Education conducted training programmes for farmers, staff of development departments, railway employees, higher secondary teachers, bank staff and IAS probationers. The University participated in the fairs and exhibitions conducted in the state. The lab-to-land programme benefitted 3,000 small and marginal farmers Quality seeds were supplied to farmers and organisations. Plant clinics were established at Vellore, Kancheepuram and Palayamkottai to solve diagnostic and remedial problems encountered by farmers in the remote villages in the respective districts.

The Farmers' Training Centres at Madurai and Coimbatore organised village seminars, peripatetic demonstrations and adaptive research trials. The lab to land programme of the centre at Coimbatore helped in transfer of technology to 750 small and marginal dryland farmers distributed in three villages in the district. The centre at Madurai organised a compact block demonstration on rice. The centres also conducted training programmes for farmers and organised a broad range of contact programmes like crop days, field days and educational tours.

The National Demonstrations at Madurai and Vellore and adaptive research trials at Coimbatore, Madurai, Pondicherry, Aduthurai, Vridhachalam and Kovilpatti facilitated the transfer of technology from research laboratories to farmers' fields.

His Excellency Thiru Sadiq Ali, Governor of Tamil Nadu and Chancellor of the University at the TNAU Pavilion in the Science Sammelan Exhibition held in January 1981 at the Perarignar Anna University of Technology, Madras.

Hon'ble Thiru K. Kalimuthu, Minister for Agriculture at the Field Laboratory-cum-Seed Chamber at the Paddy Breeding Station, Coimbatore, on October 31, 1980. Dr. S. Chelliah, Professor of Rice Entomology explains.

Hon'ble Thiru K.A. Krishnasamy, Minister for Rural Industries, during his field visit on September 27, 1980.

Hon'ble Thiru R. V. Swaminathan, Union Minister for Agriculture, during his field visit on December 24, 1980. Dr. R. S. Annappan, Professor of Pulses explains.

2. UNIVERSITY ADMINISTRATION

A. Officers of the University

Chancellor	:	Thiru Prabudas B. Patwari, His Excellency Governor of Tamil Nadu (Upto 4 11.1980)
	:	Thiru Sadiq Ali, His Excellency Governor of Tamil Nadu (From 5.11.1980)
Pro-Chancellor	:	Thiru T.N. Lakshmi Narayanan, Advisor to the Governor (L) (Upto 8.6.1980)
	:	Thiru K. Kalimuthu, Hon'ble Minister for Agriculture (From 9.6.1980)
Vice-Chancellor	:	Thiru A. Venkataraman, I.A.S.
Registrar	:	Dr. D. Raj
Comptroller	:	Thiru P. V. Krishnamoorthy
Dean, Agricultural College and Research Institute, Coimbatore.	:	Dr. V. N. Madhava Rao
Dean, Agricultural College and Research Institute, Madurai.	:	Dr. K. K. Krishnamoorthy
Dean, Veterinary College, Madras.	:	Dr. V. M. Ramaswamy
Dean, College of Agricultural Engineering, Coimbatore.	:	Prof. R. K. Sivanappan
Dean, Basic Sciences and Humanities, Coimbatore.	:	Dr. S. R. Sree Rangasamy
Dean, Faculty of Horticulture, Coimbatore.	:	Dr. C. R. Muthukrishnan
Dean, Post Graduate Studies, Coimbatore.	:	Dr. P. Chandrasekaran

Dean, Fisheries College, Tuticorin	:	**Dr. M. N. Kutty (Upto 12.5.1980)**
		Thiru K. C. Joseph (Upto 19.1.1981)
		Dr. M. D. K. Kuthalingam (From 20.1,1981)
Director of Research (Agri.)	:	Dr. S. Jayaraj
Director of Research (Animal Sciences)	:	Dr. S. Rajamani
Director of Extension Education	:	Dr. Y. B. Morachan
Director, School of Generics, Coimbatore.	:	Dr. P. V. Marappan
Director, CARDS, Coimbatore.	:	Dr. V. Rajagopalan

B. Board of Management

Chairman

Vice-Chancellor	:	Thiru A. Venkataraman, I.A.S.

Members

Commissioner & Secretary to Government, Agriculture Department.	:	Thiru N. Hari Basker, I A S.
Commissioner & Secretary to Government, Finance Department	:	Thiru K. Venkataraman, I.A.S.
	:	Thiru K. J. M. Shetty, I.A.S. (From 5.10.1980)
Director of Agriculture	:	Thiru S. A. Subramani, I.A.S.
Director of Fisheries	:	Thiru C, Chellappa, I.A.S.
Director, Animal Husbandry	:	Thiru P. Doraiswamy, I.A.S. (Upto May, 1980)
	:	Thiru A. P. Bhatiker, I.A.S. (Upto 15.6.1980)
	:	Tmt. Latika D. Padalkar (Upto 16 6 1980)
Chief Conservator of Forests	:	**Thiru R. Pasupathi (Upto 30.9.1980)**

	:	Thiru T. Achaya, I.A.S. (From 1.10.1980)
Agricultural Scientist	:	Prof. A. Subramaniam
Crop Farmer	:	Thiru W.P.A.R. Rajaram
Livestock Farmer	:	Thiru P. S. Rajagopal Naidu
Nominee for Agro-Industries	:	Thiru K. Ramasami
Woman Social Worker	:	Tmt. Jaya Arunachalam
Educationist	:	Thiru T. S. Avinashilingam Chettiar
Nominee of I.C.A.R.	:	Dr. V. Natarajan, Asst. Director General (Nutrition)
Member of Legislative Assembly	:	Vacant (Upto 30.1.1981)
	:	Thiru K. Kuppusamy, M.L.A (From 31.1.1981)
Member of Legislative Council	:	Thiru M. Sankaralingam, M.L.C.
Member - Secretary - Registrar	:	Dr. D. Raj

Meetings of the Board of Management

During tne year under report, the Board of Management met four times on June 11, August 27 and November 11, 1980 and March 2, 1981. The following were some of the important decisions of the Board of Management.

1. Approved the esteblishment of a Rice Research Station at Livestock Research Station, Kattupakkam.
2. Approved the establisement of a Home Science College at the Madurai Campus.
3. Approved the taking over of the Banana Research Station, Virinjipuram from the State Department of Horticulture.
4. Approved the establishment of a Horticultural Complex at the Livestock Research Station, Kattupakkam.
5. Approved the establishment of a new Department of Animal Husbandry Economics at the Madras Veterinary College, Madras.
6. Approved the establishment of an Advance Centre for Plant Virology at the Main Campus.

		Thiru. K C. Joseph (From 13.5.1980 to 19.1.1981)
		Dr. M.D.K. Kuthalingam (From 20 1.1981)
		Dr. P. Chandrasekharan Dean (Post-Graduate Stuies) Coimbatore
		Dr. S. R. Sree Rangasamy Dean Faculty of Basic Sciences and Humanities, Coimbatore
		Dr. C. R. Muthukrishnan Dean Faculty of Horticulture, Coimbatore
Director of Research (Agriculture)	:	Dr. S. Jayaraj
Director of Research (Animal Sciences)	:	Dr. S. Rajamani
Director of Extension Education	:	Dr. Y. B. Morachan
Director, CARDS	:	Dr. V. Rajagopalan
Director, School of Genetics	:	Dr. P. V. Marappan
Six members among the Heads of Departments nominated by the Vice-Chancellor		Dr. K. R. Ramaswamy Professor and Head, Department of Seed Technology, Coimbatore (upto November 21, 1980)
		Dr. A. John Knight Professor and Head, Department of Agrl. Extension and Rural Sociology Coimbatore (from November 22, 1980
		Dr. T. K. Kandaswamy Professor and Head, Department of Plant Pathology, Agrl. College and Res. Institute, Madurai (upto November 21, 1980)

Dr. M. Balasubramaniam
Professor and Head, Dept. of Agrl.
Entomology, Coimbatore
(from November 22, 1980)

Dr. V. D. Guruswamy Raja
Professor and Head, Dept. of Agrl.
Botany, Agrl. Cellege and Res. Institute
Madurai

Dr. P. Kothandaraman
Professor and Head, Dept. of Poulty
Science, Veterinary College, Madras
(upto November 21, 1980)

Dr. C. A. Gopalakrishnan
Professor and Head, Dept. of
Animal Husbandry, Coimbatore
(from November 22, 1980)

Dr. R. A. Balaprakasam
Professor and Head, Dept. of Microbiology, Veterinary College, Madras

Dr. P. Ayyaluswami
Professor and Head, Dept. of Animal
Nutrition, Veterinary College, Madras

Three members having special knowledge or practical experience *in different aspects of* agriculture nominated by the Vice-Chancellor

Dr. C. N. Sambandam
Dean
Faculty of Agriculture
Annamalai University
Annamalainagar

Dr. R. Sakthivadivel
Director
Centre for Water Resources
College of Engineering, Perarignar Anna
University of Technology, Madras

Dr. A. Gnanam
Professor of Plant Physiology
School of Biological Sciences
Madurai

Secretary

Dr. D. Raj
Registrar

30. Approved the creation of a post of Assistant Professor (Plant Engg.) at Fisheries College, Tuticorin.

31. Approved the creation of a post of Associate Professor (Hort.) Faculty of Horticulture, Coimbatere.

32. Approved the creation of a post of Associate Professor of Fishery Biology at Fisheries College, Tuticorin.

33. Approved the scheme for research on improvement of chillies in the southern districts of Tamil Nadu.

34. Approved the scheme for research on medicinal and aromatic plants in collaboration with the Cinchona Department,

35. Approved the Projects on rice virus and mycoplasma diseases, banana bunchy top virus, tapioca mosaic and potato virus diseases.

36 Approved the creation of certain technical posts for the Banana Research Station, Virinchipuram and Vellore.

37. Approved the creation of certain technical posts for B.Sc. (Home Science) at the Agricultural College and Research Institute, Madurai.

38. Approved the formation of the Department of Languages aed Basic Sciences in the Fisheries College, Tuticorin.

39 Approved the strengthening of research co-ordination under the National Agricultural Research Project (NARP.)

40. Approved the establisement of a Horticultural complex at Livestock Research Station, Kattupakkam.

41. Approved the creation of the posts of Assistant Professors (Agrl. Engg.) at the Regional Research Station, Paiyur and University Research Centre, Aduthurai.

42. Approved the establishment of a new Department of Livestock and Poultry Economics at Madras Veterinary College.

43. Approved the sanctioning of new schemes in the Faculties of Veterinary and Animal Sciences, Agriculture, Hoiticulture, Agricultural Engineering, Fisheries and Basic Sciences and Humanities.

44. Approved the starting of Krishi Vigyan Kendras at Coimbatore and Madurai.

45. Approved the schemes on mariculture of fishes and brackish water prawn culture at Fisheries College, Tuticorin.

46. Approved the nomination of the Directors, School of Genetics and Centre for Agricultural and Rural Development Studies as members of the Academic Council.

47. Approved the institution of 'Research Assistantship' to pursue doctoral studies in the Tamil Nadu Agricultural University.

Board of Studies : The Board of Studies in Agriculture, Agricultural Engineering, Veterinary and Animal Sciences, Basic Sciences and Humanities, Horticulture and Fisheries Science constituted during the previous years continued during the period under report. Each Board of Studies consisted of the following members :

1. Dean of the Faculty — Chairman
2. Other Deans in the Faculty
3. Heads of Departments in the Faculty
4. All the Professors in the Faculty
5. Two elected representatives from among the Associate Professors and four from among the Assistant Professors
6. Two experts in the concerned subjects from outside the University, nominated by the Vice-Chancellor.
7. One or more Deans of other Faculties of the University nominated by the Vice-Chancellor.

Faculty of Agriculture :

Elected Members :

Dr. P. Narayanaswamy
Associate Professor of Plant Pathology
Agrl. College and Rasearch Institute
Coimbatore

Dr. M. Gopalan
Assoc. Professor of Entomology
Agrl. College and Research Institute
Coimbatore

Dr. G. Perumal
Asst. Professor of Agrl. Extension
Agrl. Collage and Research Institute
Madurai

Thiru N. Viswanathan
Asst. Professor of Agrl. Extension
Agrl. College and Research Institute
Coimbatore

Thiru S. Palaniswamy
Asst. Professor of Agrl. Botany
Agrl. Collega and Research Institute
Coimbatore

Dr. (Mrs.) P. Savithiri
Asst. Professor of Soil Science and Agrl. Chemistry
Agrl College and Research Institute
Coimbatore

Nominated Members :

Dr. S V. Patil
Director of Instruction (Post-Graduate)
University of Agrl. Sciences
Dharwar, Karnataka

Dr. N. Sadanandan
Dean, Faculty of Agriculture
Kerala Agrl. University
Trivandrum, Kerala.

Meetings : This Board of Studies conducted a meeting during the year and recommended the following to the Academic Council.

i. Certain changes in the admission strength for M,Sc. (Ag) and Ph.D. degree programmes in the Faculty of Agriculture.

ii. Certain changes in the norms for admission of post-graduate students.

iii. Certain changes in the credit load of three courses in Plant Pathology.

iv. Offering of a new course in Soil Biology.

v. Inclusion of subject of specialisation in the M Sc. (Ag)/Ph.D. degree certificate.

vi. Approval of the draft syllabi for the B.Sc. (Ag) degree programme to suit +2 students.

vii. Transfer of Plant Physiology Department from the faculity of Basic Sciences and humanities to the Faculty of Agriculture.

viiii. Starting of M Sc. (Ag) degree course in Sugarcane Production in the Faculity of Agriculture.

Faculty of Agricultural Engineering

Elected Members

Dr C. Sriram
Associate Professor
Dept. of Farm Machinery
Coimbatore (upto 19.1.80)
Vacant (from 20.1.80 to 3.3.81)

Thiru. M. Balasubramaniam
Associate Pfofessor
College of Agrl. Engineering
Coimbatore (from 4.3.81)

Thiru. K.M. Nachappan
Associate Professor
Department of Soil & Water
Conservation Engineering
College of Agrl. Engineering
Coimbatore

Thiru. L. Gothandapani
Associate Professor
College of Agrl. Engineering
Coimbatore (from 4.3.81)

Thiru. V. Murugesan
Assistant Professor
College of Agrl. Engineering
Coimbatore (from 4.3.81)

Thiru. N.C. Vijayaragavan
Assistant Professor
College of Agrl. Engineering
Coimbatore

Thiru. V.V. Sree Narayanan
Assistant Professor
Department of Agricultural Processing
Coimbatore (upto 20.11.80)
Vacant (from 21.11.80 to 4.3.81)

Thiru. K. Rangasamy
Assistant Professor
College of Agrl. Engineering
Coimbatore (from 4.3.81)

Thiru. S. Kumaravel
Assistant Professor
College of Agrl. Engineering
Coimbatore (upto 1.9.80)
Vacant (from 2.9.80 till 4.3.81)

Thiru. R. Samraj
Assistant Professor
College of Agrl. Engineering
Coimbatore from 4.3.81)

Nominated Members

Thiru. G. Ramana Reddy
Head of the Dept. of Agrl. Engineering
Andhra Pradesh Agrl. University
Andhra Pradesh.

Dr. Jose Samuel
Head of the Dept. of Agrl. Engineering
College of Agriculture
Vellayani, Kerala.

Meetings : This Board of Studies conducted two meetings during the year and recommended the following to the Academic Council:

i. Approval of the draft syllabi for the B.E. (Ag) degree programme to suit the +2 students.

ii. Approval of the bridge courses proposed for students from vocational streams in higher secondary schools.

iii. Certain changes in the courses offered in the M.E. (Ag) programme.

iv. Certain changes in the course allotted to Hort. 101

v. Approval of the reduction of final Trimester of the V.B.E. (Ag) course by giving attendance for the practical training of three weeks' duration.

Faculty of Basic Sciences and Humanities

Elected Members

Dr. S. Sadasivam
Assoc. Prafessor of Biochemistry
Tamil Nadu Agrl. University
Coimbatore

Thiru. N. Natarajarathinam
Deputy Director of Research (Agri)
Coimbatore

Thiru. S. Subramanian
Assistant Professor of Psychology
Agrl. College & Res. Institute
Coimbatore

Thiiu. R. Rangaswamy
Assistant Professor of Statistics
Agrl. College & Res. Institute
Coimbatore

Thiru. R. Israel Mansingh
Assistant Professor of English
Agrl. College & Res. Institute
Madurai

Thiru. J. Venkatakrishnan
Assistant Professor of Biology
Madras Veterinary College
Madras

Nominated Members

Dr. K.S.K. Shastry
Professor of Crop Physiology
University of Agrl. Sciences
Bangalore

Dr. B.B. Sundaresan
Director
National Environmental Engineering
Research Institute
Nagpur

Meetings: This Board of studies conducted two meetings during this year and recommended the following to the Academic Council :

i. Syllabus for B. Sc. (Home Science) degree programme.

ii. Syllebus for B. Sc. (Sericulture) degree programme.

ii. Certain changes in the syllabi for post - graduate courses in Statisticst and Languages.

iv. Transfer of the Department of Plant Physiology from the Faculty of Basic Sciences & Humanities to the Faculty of Agriculture.

v. Starting of Diploma Course in Sericulture.

Facnlty of Veterinary and Animal Sciences

Elected Members :

Dr. R. Kadirvel
Associate Professor of Animal Nutrition
Madras Veterinary Dollege

Dr. M. S. Gopal
Associate Professor of Clinics
Madras Veterinary College
Madras

Dr. B. Gowrisankar
Assistant Professor of Pharmacology
Madras Veterinary College
Madras

Dr. R. Kumararaj
Assistant Research Officer
Poultry Research Station
Madras

Dr. V. D. Padmanaban
Assistant Professor of Microbiology &
Biochemistry
Madras Veterinary College
Madras

Dr. A. M. Shanmugam
Assistant Professor of Lab. Animal Medicine
Madras Veterinary College
Madras

Nominated Members

Dr. K. Sathyanarayana Rao
Assistant Professor of Lab. Animal Medicine
College of Veterinary Science
Tirupathi

Dr. V. Venkiah
Principal
College of Veterinary Science
Andhra Pradesh Agricultural University
Hyderabad

Meetings : This Board of Studies conducted a meeting during this year and recommended the following to the Academic Council :

i. Revised curricula and syllabi for the fourth and final B. V. Sc. degree programmes under trimester system.

ii. Addition, alternation and substitution, of courses in the first B.V.Sc. degree programme to suit the +2 students.

iii. Draft syllabi for Ph. D. programme in Physiology.

iv. Draft advanced courses for Ph. D. programme in the different fields of Veterinary Faculty.

Faculty of Fisheries

Elected Members :

Thiru C. G. Joseph
Assistant Professor
Fisheries College
Tuticorin

Thiru Samuel Paulraj
Assistant Professor of Fisheries
Coimbatore

Thriu P. Jayachandran
Assistant Professor
Fisheries College
Tuticorin

Dr. V. Venkataramanujam
Assistant Professor
Fisheries College
Tuticorin

Thiru Sanjeevaraj
Assistant Professor
Fisheries College
Tuticorin

Nominated Members

Prof. R. Natarajan
Director
Centre for Advanced Study in
Marine Biology
Annamalai University
Parangipettai (Porto novo)

Prof, H. P. C. Shetty
Director of Instruction
Fisheries College
University of AgriculturalSciences
Mangalore

Meetings : The Board of studies conducted two meetings during the year and recommended the following to the Academic Council :

i. Curricula and Syllabi for the B. F. Sc. degree programme.

ii. Revised syllabus for the B. F. Sc. programme.

iii. Starting of post - graduate programme in Fisheries College, Tuticorin.

iv. Curricula and syllabi for the post - graduate programme leading to M. F. Sc. degree.

v. Admission norms for the post - graduate degree programmes.

vi. Conducting the I B. F. Sc. classes at Fisheries College, Tuticorin from the academic year 1980-81,

Faculty of Horticulture

Elected Members :

Thiru R. Balakrishnan
Assoc. Professor
Faculty of Horticulture
Coimbatore

Thiru C. M. Bhakthavatsalu
Assoc. Professor
Faculty of Horticulture
Coimbatore

Thiru P. Selvaraj
Asst. Professor
Faculty of Horticulture
Coimbatore

Thiru S. Sathiyamurthi
Asst. Professor
Faculty of Horticulture
Coimbatore

Thiru S. Thamburaj
Asst. Professor
Faculty of Horticulture
Coimbatore

Thiru I. Irulappan
Asst. Professor
Faculty of Horticulture
Coimbatore

Nominated Members :

Dr. B. Ranga Reddy
Professor and Head
Dept. of Horticulture
Andhra Pradesh Agrl. University
Rajendra Nagar
Hyderabad.

Prof. K. Srinivasan
Head of the Dept. of Horticulture
Agrl. College & Res. Institute
Vellayani, Trivandrum
Kerala State.

Meetings: The Board of Studies conducted a meeting during this year and recommended the following to the Academic Council :

i. Changes in admission strength for Ph. D. in the Faculty of Horticulture

ii. Changes in the admission norms to be adopted.

Board of Examinations : The Board of Examinations met four times during the year under report. The following decisions were taken :

1. Reviewed, moderated and provisionally declared the results of the B.V.Sc March 1980 candidates.
2. Ratified the changes made in the appointment of external examiner s fo B. V. Sc. August 1980 examinations.
3. Ratified the change made in the date of commencement of B. V. Sc. May 1980 examinations.
4. Reviewed, moderated and provisionally declared the results of the B.V.Sc. August 1980 candidates.
5. Ratified the dates fixed for the receipt of applications and commencement of B. V. Sc. November 1980 candidates.
6. Reviewed, moderated and provisionally declared the results of B. V. Sc. November 1980 candidates.
7. Ratified the dates fixed for the receipt of applications and commencement of B. V. Sc. February 1981 examinations.
8. Ratified the changes made in the appointment of external and internal examiners for B. V. Sc. February 1981 examinations.
9. Reviewed, moderated and provisionally declared the results of B. V. Sc. February 1981 candidates.

Dr. V.N. Madhava Rao
Dean (Agriculture)
Coimbatore

Dr. K K. Krishnamoorthy
Dean (Agriculture)
Madurai

Dr. C.R. Muthukrishnan
Dean (Horticulture)
Coimbatore

Dr. V.M. Ramaswamy
Dean (Veterinary Science)
Madras

Dr. S.R. Sree Rangaswamy
Basic Sciences & Humanities
Coimbatore

Prof. R K. Sivanappan
Dean (Agrl. Engineering)
Coimbatore

Dr. M. Narayanakutti
Dean (Fisheries Science)
Tuticorin (upto 12.5.80)

Thiru. K.C. Joseph
Dean (Fisheries Science) i/c
Tuticorin (upto 19.1.81)

Dr. M.D.K. Kuthalingam
Dean (Fishery Science)
Tuticorin (upto 20.1 81)

Directors ... Dr. Y B. Morachan
Director of Extension Education
Coimbatore

Dr. P.V. Marappan
Director
School of Genetics
Coimbatore

Dr. V. Rajagopalan
Director CARDS
Coimbatore

Dr. S. Rajamani
Director of Research (Animal Sciences)
Coimbatore

Heads of Departments ... Dr T.S. Muthukrishnan
Professor and Head
Department of Nematology
Coimbatore

Dr. T.K. Kandaswamy
Professor and Head
Department of Plant Pathology
Madurai

Dr. L. Venkatayyan
Professor and Head
Department of Physiology
Madras Veterlnary College
Madras

Dr. R.A. Balaprakasam
Professor and Head
Department of Microbiology
Madras Veterinary College
Madras

Dr. C.A. Gopalakrishnan
Professor and Head
Department of Animal Husbandry
Tamil Nadu Agrl. University
Coimbatore

Government ... Thiru. S.A.Subramani, I.A.S.
Director of Agriculture
Madras

Thiru. A.P. Bhatiker, I.A.S,
Director of Animal Husbandry
Madras

Thiru. C. Chellappan, I.A.S.
Director of Fisheries
Madras

	Thiru. R. Pasupathy. I.A.S. Chief Conservator of Forests Madras
Non-Official	Thiru. S.E Anandaraman, B.E. Managing Director (Retd) Agro-Industries Corporation 17, Arcot Mudaliar Street Thiagaraya Nagar Madras
	Thiru. C.L. Sundararajan, B.Sc. (Ag) Agriculturalist 544, Big Bazaar Street Coimbatore
	Dr. S. Krishnaswamy Professor of Dairy Science (Retd) 53, Sukrawarpet Coimbatore
	Thiru. A. Jayadev, I.F.S. Chief Conservator of Forests (Retd) Forests Research & Development 15, First Cross Indranagar Madras
	Thiru. K. Kannaiyan, B Sc. (Ag) Cotton Specialist (Retd) R.M.S. Colony Kalyani Bhavan Thanjavur
Member-Secretary ...	Dr. S. Jayaraj Director of Researcn (Agri) Coimbatore

Meeting of the Research Conucil

The fifteenth meeting of the council was held on July, 7, 1980. The salient findings of research projects as on June 30 1980 were discussed in the meeting. The recommendations of the meeting were communicated to the heads of departments for follow up.

Extension Education Council

Chairman	:	Thiru A. Venkataraman, I. A. S., Vice-Chancellor, Tamil Nadu Agrl. University, Coimbatore.
Member - Secretary		Dr. Y. B. Morachan, Director of Extension Education, Tamil Nadu Agrl. University, Coimbatore.
Members	:	**Non - official**

Thiru K. Palaniappan
Project Manager (Seeds and Pesticides)
Sakthi Sugars limited
73 - A, Race Course Road
Coimbatore.

Thiru Chevaliar Mechado, K.S.G.
50, Beach Road,
Tuticorin.

Thiru C. Muthian Chettiar
Karuvalkarai - P. O.
Sembanarkoil,
Mayuram Taluk
Thanjavur District.

Thiru P. Gomathinayagam
Seva Nilayam
Puliyangudi (Via) Sankarankoil
Tirunelveli District.

Thiru S. S. Nagarajan
Chief Agricultural Economist and Adviser
Tractors and Farm Equipment
Madras.

Government

Thiru S. A. Subramani, I. A. S.,
Director of Agriculture,
Madras.

Thiru C. Chellappan, I. A. S.,
Director of Fisheries
Cathedral
Madras.

Tmt. Latika D. Padalkar, I. A. S.,
Director of Animal Husbandry
Cathedral
Madras.

Thiru T. Achaya, I. F. S.,
Chief Conservator of Forests
Cathedral
Madras.

University

Dr. D. Raj,
Registrar,
Tamil Nadu Agrl. University
Coimbatore.

Dr. P. Chandrasekaran
Dean (P. G. Studies),
Tamil Nadu Agrl. University
Coimbatore.

Dr. V. N. Madhava Rao,
Dean (Agri.)
Tamil Nadu Agrl. University
Coimbatore.

Prof. R. K. Sivanappan,
Dean,
College of Agrl. Engineering,
Coimbatore.

Dr. C. R. Muthukrishnan,
Dean (Hort.),
Tamil Nadu Agrl. University
Coimbatore.

Dr. S. R. Sree Rangaswamy,
Dean (Basic Sciences & Humanities)
Tamil Nadu Agricultural University
Coimbatore.

Dr. S. Jayaraj,
Director of Research (Agri.)
Tamil Nadu Agri. University
Coimbatore.

Dr. S. Rajamani,
Director of Research (Animal Science)
Tamil Nadu Agrl University
Coimbatore.

Dr. V Rajagopalan
Director - CARDS
Tamil Nadu Agrl. University
Coimbatore.

Dr. P. V. Marappan,
Director,
School of Genetics
Tamil Nadu Agrl. University
Coimbatore

Dr. K. K. Krishnamoorthy,
Dean,
Agricultural College and Research Institute,
Madurai.

Dr. A. John Knight,
Professor and Head,
Department of Agricultural Extension and Rural Sociology,
Tamil Nadu Agrl. University
Coimbatore.

Prof. K. Radhakrishna Menon,
Professor and Head,
Department of Agricultural Extension
Agrl. College and Research Institute,
Madurai.

Dr. V. M. Ramaswamy,
Dean,
Veterinary College,
Madras.

Dr. M. P. Arumugam,
Professor of Extension,
Veterinary College,
Madras.

Dr. M. D. K. Kuthalingam,
Dean, Fisheries College,
Tuticorin.

Special Invitees

Director of Horticulture,
Dharmapuri.

Director of Agricultural Marketing,
Trichy.

Director of Seed Certification,
Coimbatore.

Director of Oilseeds,
Madras.

Seminars, Symposia, Workshops, etc.

The University collaborated with the State Department of Agriculture and the State Marketing Committee participating in the Government Exhibition held at Coimbatore in April 1980.

Seminar on "Biochemistry in the Service of Mankind : The Department of Biochemistry, Tamil Nadu Agricultural University, Coimbatore and the Society of Biological Chemists (India) conducted a seminar on "Biochemistry in the Service of Mankind" at Coimbatore. Thiru A. Venkataraman, I.A S., Vice-Chancellor and Dr. D. Raj, Registrar, Tamil Nadu Agricultural University and Dr. M. Leela Meenakshi, Director, Valavadi Cancer Institute, participated in the inaugural function.

Exhibition-cum-Workshop on Agricultural Engineering : A three day exhibition-cum-workshop on agricultural Engineering was organised by the College of Agricultural Engineering at Coimbatore from April 28 to 30. Three bulletins were released and the achievements explained to farmers and staff of state development departments.

Sorghum Workshop : The 10th All India Coordinated Sorghum Workshop was held at Coimbatore from May 12 to 14. Dr. C. Kempenna, Assitant Director General (C.C.), ICAR inaugurated the workshop. The key-note address was delivered by Thiru A. Venkataraman, I.A.S., Vice-Chancellor, Tamil Nadu Agricultural University. The workshop was attended by 120 scientific workers from all over India.

Seed Seminar : The Indian Society of Seed Technology conducted the 5th All India Seed Seminar from May 15 to 18 at Coimbatore. The seminar was inaugurated by Thiru A. Venkataraman, I.A.S., Vice-Chancellor. Tamil Nadu Agricultural University. Two hundred delegates from various states of the country attended the seminar.

Seminar on Inland and Coastal Fish Culture : A seminar on inland and Coastal fish culture in Tamil Nadu was held at the Fisheries College, Tuticorin. The seminar was inaugurated by Thiru C. Chellappan, I.A.S. Director of Fisheries,. Seventy delegates from the State Department of Fisheries, Fishery Development Corporation, Central Marine Fisheries Research Institute, Central Inland Fisheries Research Institute and Marine Product Export Development Authority, participated in the seminar.

Group Discussion on the Results of fertilizer Experiments : A meeting was held under the chairmanship of Thiru A. Venkataraman, I.A.S., Vice-Chancellor, Tamil Nadu Agricultural University at Coimbatore, on June 4th and 5th, to discuss the results of fertilizer experiments conducted by the State Department of Agriculture. The Director and staff of the State Department of the Agriculture and staff of the Tamil Nadu Agricultural University attended the meeting.

Seminar on Strategies for Rural Developmeat : A seminar on strategies for rural development was held at Coimbatore on July 12th and 13th. Hon'ble Thiru K. Kalimuthu, Minister for Agriculture and Pro-Chancellor of Tamil Nadu Agricultural University addressed the seminar. Officers from the State Departments of Agriculture, Animal Husbandry, Rural Development, Industry and Cooperation participated in the Seminar.

Seminar on Planning for Education and Motivation of Subsistance Farmers : A national seminar-cum-workshop on planning for education and motivation of subsistance farmers was conducted in the Department of Agricultural Extension and Rural Sociology on July 17th and 18th, The seminar-cum-workshop was presided over by Thiru N. Perumal, Director of Extension Training, Government of India and Thiru A. Venkataraman, I.A.S., Vice-Chancellor, Tamil Nadu Agricultural University, delivered the key-note address. Delegates from the states of Bihar, Delhi, Karnataka, Andhra Pradesh, Kerala and Tamil Nadu participated in the seminar.

Seminar on Application of Genetics to the improvement of Groundnut : A seminar on the application of genetics to the improvement of groundnut was conducted in the School of Genetics on July 16th and 17th. Scientific workers from groundnut growing states participated in the seminar.

Seminar on Banana Production Technology : A national seminar on banana production technology was organised by the Faculty of Horticulture, Tamil Nadu Agricultural University at Coimbatore on July 18th

and 19th. The seminar was inaugurated by Thiru A. Venkataraman, I. A S., Vice-Chancellor, Tamil Nadu Agricultural University and was attended by research workers from banana growing states of the country.

Seminar on Agroclimatology : A national seminar on agroclimatology was organised by the Department of Agronomy, Tamil Nadu Agricultural University, Coimbatore on July 28th and 29th. Delegates from eight states and the representatives from ICAR and Central Agrometeorology Department Poona, participated in the seminar. The presidential address was delivered by Thiru A. Venkataraman, I. A. S., Vice-Chancellor, Tamil Nadu Agricultural University.

Seminar on Commercial Flower Crops : A national seminar on production technology for commercial flower crops was organised by the Faculty of Horticulture, Tamil Nadu Agricultural University, Coimbatore on August 29th and 30th Thiru A. Venkataraman, I. A. S., Vice-Chancellor, Tamil Nadu Agricultutural University, delivered the inaugural address.

Seminar on Pest Management in Rice : A National seminar on pest management in rice was organised at Coimbatore on October 30th and 31st. Agricultural entomologists from all ovet the country and from International Rice Research Institute, Philippines, participated in the seminar. The inaugural address was presented by Thiru A. Venkataraman, I.A.S., Vice-Chancellor, Tamil Nadu Agricultural University.

Seminar on Research Perspectives in Agricultural Economics : Thiru T. S. Avinashilingam, Member, Board of management, Tamil Nadu Agricultural University presented presidential address and Thiru N. Kaleeswaran, I. A. S., Vice-Chancellor, Kerala Agricultural University delivered the inaugural address in the national seminar on research perspectives organised at Coimbatore.

Seminar on Agricultural Waste Utilization : A seminar on agricultural waste utilisation was conducted on December 13th at Coimbatore. Dr. V. N. Madhava Rao, Dean, Agricultural College and Research Institute, Coimbatore, presided. Thiru K. Liakath Alikhan, Chairman, Agro-Industries Corporation, Madras, inaugurated the seminar.

Seminar on Disease Resistance to Crop Plants : A national seminar on disease resistance in crop plants was organised at Coimbatore on December 22nd and 23rd. Scientific workers from the states of Haryana, Andhra Pradesh, Karnataka and Tamil Nadu participated in the seminar. Thiru A. Venkataraman. I. A. S., Vice-Chancellor, Tamil Nadu Agricultural University, addressed the delegates in the plenary session.

Seminar on Cotton in the 1980's : The School of Genetics, Tamil Nadu Agricultural University, in collaboration with the Directorate of Cotton Development, Government of India, organised a national seminar on cotton in the

1980,s at Coimbatore from December 22 to 24. Scientific workers, cotton development officers and farmers participated in the seminar. Thiru A. Venkataraman, I.A.S., Vice-Chancellor, Tamil Nadu Agricultural University, inaugurated the seminar under the presidentship of Dr. J. Thuljaram Rao, Zonal Co-ordinator, ICAR Lab-toLand Programme Coimbatore. Hon'ble Thiru R. V. Swaminathan, Union Minister of State for Agriculture addressed the plenary session.

Seminar on Micronutrients in Agriculture : Dr. K. Mohan Naidu, Director Sugarcane Breeding Institute, Coimbatore, inaugurated a national Seminar on micronutrients in agriculture held at Coimbatore on January 7th and 8th Thiru A. Venkataraman, I.A.S., Vice-Chancellor, Tamil Nadu Agricultural University delivered the presidential address. Research workers from the states of Kerala, Andhra Pradesh, Uttar pradesh and from ICAR, TNAU and Tamil Nadu State Department of Agricuiture participated in the seminar.

Seminar on Tree Improvement : A national Seminar on tree improvement was organised at Kumaraperumal Farm Science Centre, Tiruchirapalli, on January 8. Thiru T. Achya. I.F.S., Chief Conservator of Forest, Madras, inaugurated the seminar Dr. Y. B. Morachan, Director of Extension Education, Tamil Nadu Agricultural University, presided.

Symposium on Biological Nitrogen Fixation : A National symposium on biological nitrogen fixation in relation to crop production was organised from December 29 to 31 at Coimbatore. Dr. G. Rangaswami, Adviser (Agriculture) Planning Commission, New Delhi, inaugurated the symposium. Dr. D. Raj Registrar, Tamil Nadu Agricultural University, presided. Delegates from various agricultural universities and other institutes participated in the symposium.

Seminar on Intensification of Credit to Small Farmers : The Department of Agricultural Economics, Tamil Nadu Agricultural University, Coimbatore and the National Federation of Cooperative Land Development Banks organised a seminar on intensification of credit to Small farmers and problems of financing them from February 5 to 7.

Nematology Workshop : The Indian Council of Agricultural Research and Tamil Nadu Agricultural University organised the third nematology workshop at Coimbatore from February 10 to 13. In continuation of the workshop an All India Symposium was held from February 13 to 15. Delegates from all over the country attended the workshop and symposium.

Seminar on Plantation Crops : A seminar on plantation crops was organised at the Agricultural College and Research Institute, Madurai on May 30.

Scientific Workers' Conference : Tne Annual Scientific Workers' Conference was held in the main campus on May 5. The conference, presided over by Thiru A. Venkataraman, I. A. S., was attended by the Director of Agriculture, Madras, 150 officers from the state department of agriculture and heads of departments and subject specialists of the University. The recommendations were communicated to the department concerned for follow up.

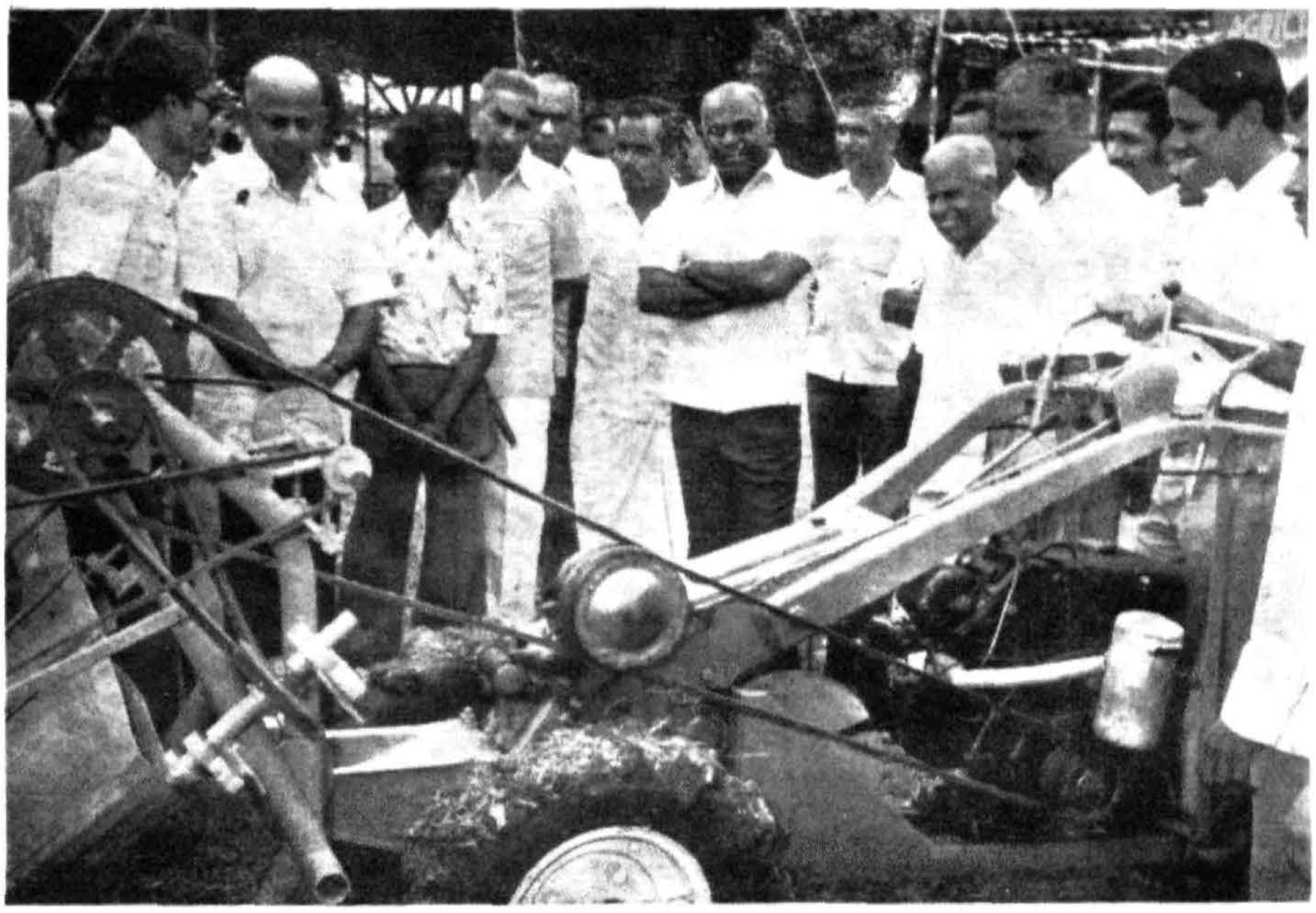
Visit to Foreign Countries by Staff Members : Thiru G. Sanjeeviraj, Assistant Professor, Department of Fishery Biology, Fisheries College, Tuticorin, underwent practical training in fisheries, for one month, at Odra Enterprise of Deep Sea Fishing Services of Swinoujscie in Poland.

Prof. R. K. Sivanappan, Dean, College of Agricultural Engineering attended an International Symposium on Problems of Soil Erosion and Sedimentation, at Bangkok, Thailand.

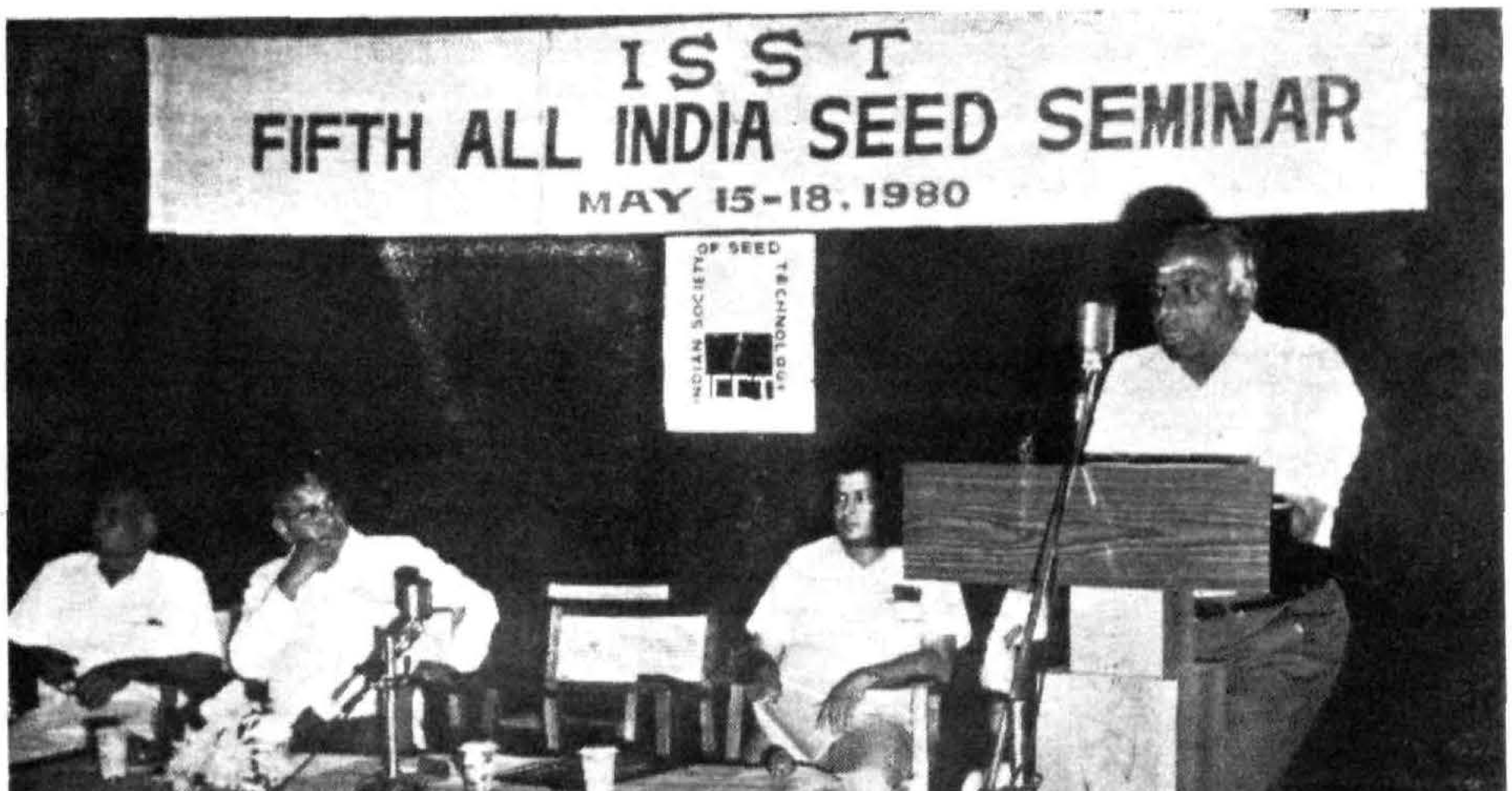
Dr. G. Oblisami, Professor and Head, Department of Agricultural Microbiology, Tamil Nadu Agricultural University, Coimbatore, participated in the International Workshop on Biological Nitrogen Fixation Technology for Tropical Agriculture, at CIAT, Colombia, South America, and presented a paper.

Campus Development

Two major construction works viz. Ladies Hostel for accommodating 75 students and first floor over the Engineering College building were completed at a cost of Rs. 13 lakhs and Rs. 12 lakhs respectively. Field laboratories-cum-seed storage chambers for Cotton Breeding Station, Millet Breeding Station and Paddy Breeding Station, laboratories and class-rooms for Seed Technology Department, extension of dining hall in the Engineering College Hostel, extension of University canteen, four drivers' quarters and a building for students' indoor games were the other works completed. The constructions of glass house at Paddy Breeding Station, field laboratory at the Insectory and kitchen in the Engineering College Hostel were in progress. The following works were completed at the research stations: seed complex at Bhavanisagar; sheep sheds and watchman's quarters at Sandynallah; godown and cattle shed at Aliyarnagar; godown and watchmen's huts at Yercaud; staff quarters and pump houses at Paiyur; overhead tank, pump house and jeep shed at Mettupalayam; kitchen and dining hall improvements at Madras Veterinary College Hostel; artificial insemination building, isotope laboratory, staff quarters and teachers' hostel at Madras Veterinary College; poultry houses, overhead tank and guest house at Thenampettai, laboratory building and cattle sheds at Kattupakkam; school building and overhead tank at Pondicherry; river pumping, poultry house and godown at Thiruchirapalli; water tank and threshing floor at Thadiyankudisai; weirs, vehicle shed, roads, godowns and hostel building at Tuticorin. Constructions of Microbiology building at Madras Veterinary College, Cattle sheds and bull sheds at Kattupakkam, Regional laboratories at Paiyur and Thiruchirapalli, staff quarters at Pondicherry, garages and godown at Virudhachalam, office building at Thadiyankudisai, hostel building at Madurai, laboratory buildings and workshops at Tuticorin and glass house at Coimbatore were also started.



Power Tiller Operated Thresher exhibited during the Exhibition-Cum-Workshop on Agricultural Engineering held at Coimbatore during April 28-30, 1980. Farmers and Industrial Entrepreuners are looking on.



Thiru A. Venkataraman IAS, Vice-Chancellor, inaugurating the Fifth All-India Seed Seminar of Indian Society of Seed Technology, at Coimbatore, on May 15, 1980.

Thiru C. Subramaniam, former Union Minister, addressing the delegates of the Seminar on *Strategies for Rural Development held at Coimbatore, on July 12 & 13, 1980.*

Dr. A. John Knight, Professor and Head of the Department of Agricultural Extension and Rural **Sociology, Coimbatore, addressing the participants of National Seminar**-cum-**Workshop on Planning for Education and Motivation of Subsistence Farmers, on July 18, 1980.**

Thiru T S. Avinashilingam, Member, Board of Management, TNAU, addressing the delegates of the National Seminar on Research Perspectives in Agricultural Economics,at Coimbatore, on December 4 & 5, 1980.

Dr. K. Mohan Naidu, Director, Sugarcane Breeding Institute, Coimbatore, inaugurating the National Seminar on Micronutrients in Agriculture, at Coimbatore, on January 7 & 8, 1981.

Farmers' Day on the occasion of Silver Jubilee of the Agricultural Research Station, Bhavanisagar, on April 5, 1980.

Dr. M. S. Swaminathan, Member, Planning Commission, at the Paddy Breeding Station, on October 6, 1980.

3. TEACHING

Faculty of Agriculture

(A) Agricultural College and Research Institute, Coimbatore.

The Agricultural College and Research Institute, Coimbatore continued to offer B. Sc.(Ag), B. Sc. (Hort), M. Sc.(Ag) and Ph.D , programmes under trimester system. Dr. V N. Madhava Rao held the post of Dean during the year.

Admission : The College reopened on September 1, 1980 for third and fourth year B.Sc.(Ag) classes. The courses for the second B.Sc.(Ag) started on October 22, 1980. The classes for the first year B.Sc (Ag) commenced on January 27, 1981. The number of students admitted in the first, second, third and fourth B.Sc.(Ag) classes were 122, 117 121 and 126 respectively.

Examinations : Apart from the regular tests and examinations under the trimester system, a supplementary examination was conducted during November 1980 for the benefit of students having large number of arrear courses

Academic Programmes : With the introduction of the 10+2 system at the Higher Secondary Schools, the B.Sc.(Ag) degree syllabus was restructured.

Besides the academic stream students from the Higher Secondary Schools, vocational stream students who have studied agricultural courses were also admitted.

The duration of the B.Sc.(Ag) degree programme was reduced from the current 12 trimesters of 206 credits to 11 trimesters of 187 credits.

Tours : The final year B.Sc.(Ag) students went on an All India tour from February 16, 1981 onwards for 21 days. During the tour the students visited important research stations institutions like IARI, New Delhi; Punjab Agricultural University, Ludhiana; Central Potato Research Institute, Simla; ICRISAT, Hydrabad; Indian Institute of Horticultural Research and University of Agricultural Sciences, Bangalore; and Arey Milk Colony, Anand.

were purchased by limited tender system. Groceries and vegetables were bought from Chinthamani Co-operative Super Market and Coimbatore Urban Co-operative Store. Milk was purchased from the Coimbatore Milk Producers' Union. Controlled commodities like sugar, maida, and Suji were purchased from the Civil Supplies Corporation. The students representatives of the messes were given all guidance for the smooth functioning of the messes. A sum of Rs. 13,56,408 was spent on groceries and other requirements. For the purchase of utencils, furniture etc., a sum of Rs. 59,600 was spent. The students' Canteen continued to serve the needs of students by selling stationery, cosmetics, snacks, coffee and tea. To serve the needs of the Women's Hostel inmates a canteen was opened to sell stationery, cosmetics, toiletries, confectionaries etc. A sum of Rs. 1,25,000 was spent towards the purchase of articles for the students' canteen.

Entertainment films were screened in the University Auditorium. The facilities for games, gymnasium, swimming pool and music room were well utilized by the students in their pastime.

Students Club : Thiruvalargal M. Kumaravel and M. Ayyaswamy, fourth year B. Sc. (Ag.) were elected as Club Secretary and Games Secretary respectively. Thiruvalargal N. Shamugasundaram, fifth year B.E. (Ag.) and P T. Kalaisel van, fourth year B. Sc. (Hort.) were elected as Joint Club Secretaries.

The inauguration of the students' club activities was held on October 11, 1980. Hon'ble Thiru P. Kulandaivelu, Minister for Local Administration, delivered the inaugural address. Thiru A. Venkataraman, I. A. S., Vice-Chancellor, presided over the function.

Under the auspices of the students' club, a felicitation was arranged to Hon'ble Thiru K. Kalimuthu, Minister for Agriculture and Pro-Chancellor of the University on October 31, 1980.

The Republic Day was celebrated on January 26, 1981. Thiru A. Venkataraman, I.A.S., Vice-Chancellor hoisted the national flag and took the salute. The N. C. C. presented a guard of honour.

The Orientation Day for the freshers was conducted on January 29, 1981. The Heads of Departments and Ward Councellors were introduced to the freshers and a Carnival Show was organised to orient the new students to campus life.

Sports and Games : The inter-collegiate hockey tournament was conducted from September 4, 1980 to September 6, 1980 in the campus grounds. The PSG College of Technology won the trophy. The Coimbatore campus hockey team participated in the Universal Recreation Club silver jubilee hockey tournament and CDHA League tournaments during September 1980.

The campus athletic team participated in the Coimbatore district inter-collegiate sports meet held on September 18th and 19th, 1980 at PRS Grounds Thiru. Sureshkumar second year B.Sc. (Ag.) won first place in high jump and secured second place in 4 x 400 mts. relay. Mr G. Gnanaprakasam, fourth year B.E. (Ag) won first place in 1500 mts. race conducted by the Government College of Technology, Coimbatore.

The I.C.A.R. inter-institutional sports meet was conducted from November 15, 1980 to November 23, 1980.

The state level junior foot-ball coaching camp was conducted in the campus grounds from January 3, 1981 to January 23, 1981.

The Coimbatore inter-collegiate foot-ball tournament was conducted in the campus grounds from January 27, 1981 to January 30, 1981. The P.S.G. College of Technology, Coimbatore won the tournament.

The Kabadi team participated in the inter-collegiate tournament held at Kongunadu Arts College, Coimbatore on January 31, 1981

The Kalaimani memorial football tournament was conducted from February 2, 1981 to February 4, 1981. The colleges in Coimbatore district participated in the tournament. The P.S.G. College of Arts and Science and the Tamil Nadu Agricultural University won the first and second places respectively.

The Coimbatore inter-collegiate basket-ball tournament was conducted from February 9, 1981 to February 11, 1981. The P.S.G College of Technology and the Campus team won the first and second places respectively. The campus volley-ball team participated in the Coimbatore inter-collegiate tournament at Madurai College of Physical Education on February 12th and 13th, 1981 and reached semi-finals

The campus basket-ball team participated in the state level inter collegiate tournament conducted by tha P.S G. College of Arrs and Science from February 12, 1981 to February 14 1981 and secured third position.

The tennis team participated in the Coimbatore inter-Collegiate tennis tournaments at the Forest College. The cricket team participated in the Santeosh Trophy and Red Sun Cricket tournaments.

Inter-University Tournaments: The campus team participated in football, volley-ball, basket-ball and hockey tournaments of the inter-University (South Zone) tournaments. Thiru. M. Senthil Vadivelu, Third B.Sc. (Ag) represented Tamil Nadu in the basket-ball team sent to Srilanka. He was also selected to participate in the national basketball championship to be held at Indore. He was also selected for the South Zone NSC coaching-cum-competition programme in basketball game

Arts and Photographic Society: The Arts and Photographic Society organised an art competition for school children on November 23, 1980.

Debating Society: The debating society organised guest lectures by Thiruvalargal Deepam Parthasarathy and P. Metha on November 30, 1980.

Thiruvalargal V.S. Senthil, first year M.Sc. (Ag) and Satish Thambi, fifth year B.E. (Ag) participated in the debating competition held by the National Council of Co-operative Training at Nagpur,

The Debating Society organised a special lecture on Yoga by Yogiraj Vedathir Maharishi on January 30, 1981 at Anna Auditorium. Dr. P. Chandrasakaran, Dean (P.G. Studies) presided.

The inler-collegiate debats for Karunakar Rolling Cup (for English) and Dr. N. Parthasarathy Cup (for Tamil) were held on February 14, 1981. The winners were P.S.G. Arts and Science College and Government Arts College respectively.

Hiking Society: The Hiking Society organised a trip to Kallar on January 3, 1981. One hundred students participated in the hiking.

Dramatic Society: The dramatic society participated in the inter-collegiate cultural competition organised by the C.I.T. Students' Union on February 15, 1981 and won several prizes.

The society also participated in several competitions in drama, music and other cultural events conducted by the G.C.T., Lions Club and P.S.G. College of Technology and won many prizes crowned by a prize for overall performance at the state level.

National Cadet Corps: Certificates of Merit were awarded to the cadets. 2 Lt. Dr. P. Rajasekaran, NCC Officer of the University attended the annual inspection of 4 TN BN NCC HQ, carried out by Lt. Col. J. Torphy V.S.M. Group Commender, N.C.C. Grouy HQ, Pondicherry, on May 22, 1980. 2 Lt. Dr. P. Rajasekaran, attended the NCC Officers Conference at NCC HQ, Red Fields, Coimbatore on July 29, 1980. Twentyfour out of 28 cadets who appeared for the 'B' certificate exam were declared to have passed. The following cadets attended the attachment of NCC cadets with the regular army unit at MRC, Wellington from June 16, 1980 to July 6, 1980.: L/Cpl V. Lingiah; L/Cpl P. Satish; L/Cpl. A.L. Venkataraman; L/Cpl. P. Tamilkalangiam. Eleven new cadets were enrolled on September 13, 1980. Promotion parade was conducted and deserving cadets were given promotion to various ranks on October 25, 1980. The cadets were taken on a route-march to practtce identification of field signals and map reading, November 22, 1980. Thirty cadets and one officer of 4/4 TN BN NCC attended the annual training camp at R.S. Puram Higher Secondary School for Boys from December 25, 1980 to

January 4, 1981. For the second year in succession TNAU Cadets won the rolling trophy for the "Best Cadets in Co-ordination and Team Spirit". The Republic Day parade was held on January 26, 1981 and Thiru A. Venkataraman, I. A. S., Vice-Chancellor received the guard of honour. The enrolement of cadets for the academic year 1980-81 was completed on January 30, 1981. Major Oberoi presided over the Certificate 'B' Examination held in the NCC office premises on February 18, 1981 and 18 cadets attended the examination. Six cadets successfully came through the first aid examination at NCC HQ from February 4, 1981 to February 11, 1981. Twelve cadets appeared for the 'C' certificate examination at Government Arts College, Coimbatore, on March 18, 1981

National Service Scheme : The National Service Scheme volunteers took part in different activities such as shramadhan, tree planting, road formation, pests and diseases identification and control, school enrolment drive, cleaning the school premises, cleaning the temple premises, kitchen gardening, cleanliness drive, small savings drive and health programmes in Chinnathadagam and Nanjundapuram villages during the year. A total of 6569 man hours were spent for the above programmes.

(B) AGRICULTURAL COLLEGE AND RESEARCH INSTITUTE MADURAI

There are ten departments in the Faculty of Agriculture and three in the Faculty of Basic Sciences and Humanities. The Dean is assisted by a Junior Accounts Officer in administration and a Warden and two Deputy Wardens in the hostel administration. A Deputy Warden for Ladies Hostel has also been appointed.

Admission : The number of students on roll is as follows :

1)	B.Sc. (Home Science)	15
2)	I B.Sc. (Ag.)	100
3)	II B.Sc. (Ag.)	79
4)	III B.Sc. (Ag.)	73
5)	IV B.Sc. (Ag.)	97
6)	I M. Sc. (Ag.)	61
7)	II M. Sc. (Ag.)	44
	Total	469

M.Sc. (Ag.) programmes in Agricultural Extension and Agricultural Economics were introduced. B.Sc. (Home Science) programme was also introduced.

Thiruvalargal P. Prabhaharan and N. V. Narayanamoorthy IV B. Sc. (Ag.) and Mr Ravi, II B. Sc.(Ag.) won the first prize in quiz competition on November 14, 1980.

Thiru G. Thirumal Ram, IV B.Sc.(Ag.), won the third prize in the oratorical contest in English on November 14, 1980.

An inter-collegiate "Kavithaipotti" was conducted on March 23, 1981 in the college auditorium. Many city colleges took part in this contest. Thiru S. S. M. Sundaram, Professor of Commerce, Sourastra College, was the Chief Guest. Abdul Rahim, Assistant Professor of the University presided over the meeting. Thiru Tomy G. Poovatil, II B. Sc. (Ag.) participated in the regional oratorical contest for students organised by the Madurai Productivity Council on February 23, 1981. Thiruvalargal Tomy G. Poovatil and Thirugnanasambantham, II B. Sc. (Ag.) participated In the inter-collegiate debating competition organised by Arulandavar College, Karumathur, on March 19, 1981.

Social Service League : Thiru P. Palanichamy, III B. Sc. (Ag.) was elected Secretary of this society and he helped in organisation of various functions.

Planning Forum : Thiru R. Moorthy, IV B. Sc. (Ag.) was elected chairman of this society. The society conducted quiz, essay, and debating and other competitions. Thiru R. Sundaramoothy, IV B.Sc. (Ag.) secured the highest mark in IQ test. The group led by Thiru N. V. Narayanamoorthy, IV B. Sc. (Ag.) won the first prize in the quiz competition. Thiru S. Rajendran, IV B. Sc. (Ag.) won the first prize in the Tamil essay competition and Thiru Albert Gabriel, IV B. Sc. (Ag.) won ihe first place in English essay competition. In the Tamil debate the first prize was won by Thiru Tomy G. Poovatil, II B. Sc. (Ag.). Thiru Albert Gobriel, IV B. Sc. (Ag.) won the first prize in the English debate.

Sports and Games : The following students represented the University in the Inter-University Tournaments in South India.

Foot Ball

1. Tniru P. Rajan, IV B. Sc. (Ag.) 2. Thiru R. P. Asokan, IV B. Sc. (Ag.)	Southern Zone Inter-University Tournment, Andhra University, Waltair.

Volley ball

1. Thiru S. Gnanavel, II M. Sc. (Ag.) 2. Thiru P. Mannidurai Manoharan David, II M. Sc. (Ag.) 3. Thiru N. Venkatachalam, IV B. Sc. (Ag.) 4. Thiru K. Venkatesan, IV B. Sc. (Ag.) 5. Thıru S. Vijayaraj, IV B. Sc. (Ag.)	Southern Zone Inter-University Tournment, Kerala University, Trivandram.

Hockey

1.	Thiru D. Dhanakumar, II M. Sc. (Ag.)	Southern Zone Inter - University Tournament, Madurai - Kamaraj University, Madurai.
2.	Thiru D. Samuel Dharmaraj, II M. Sc. (Ag.)	
3.	Thiru P. Rajan, IV B. Sc (Ag.)	

Basket Ball

Thiru K. Balakrishnan, II B. Sc. (Ag.)	Southern Zone Inter - University Tournament, Madurai - Kamaraj University, Madurai.

The second B. Sc. (Ag.) won the championship shield in the inter - class tournments. In the staff Vs students exhibition matches in cricket, hockey and basket ball the students won.

Thiruvalargal K. Rajan, I. B. Sc. (Ag.) and V. Sivanmoorthy, III B. Sc. (Ag.) participated in the Pro - Chancellor's Pentathalon Meet at Coimbatore campus and secured second and third places respectively.

National Cadet Corps : The National Cadet Corps D/ 2 Company was attached to the 7 (Tamil Nadu) Battalion NCC Madurai. Twentyfive cadets were enrolled from the second and third B. Sc. (Ag.) classes. The cadets were given training in foot drill, arms drill, weapon handling, field craft, map reading, first-aid and civil defence in 40 parades of 2 hours' duration each. Sqt. V. A. Mohan Kumar and Sqt. R. Rajendran, third B.Sc (Ag.) students attended army attachment training at MRC Wellington from June 16, 1980 to July 6, 1980. Seventeen cadets appeared for 'B' Certificate examination. Fifteen cadets passed the examination and two cadets secured more than 65 per cent. Seven cadets appeared for 'C' Certificate examination. The Republic Day Parade was conducted on January 26, 1981 and the Dean distributed the certificates.

National Service Scheme : Thiru S. D. Sundarsingh, Assistant Professor of Agronomy assumed charge of the post of Programme Officer on November 3, 1980. The National Service Scheme for the year was inaugurated on December 1, 1980 by the Mayor of Madurai Corporation, Thiru S. K. Balakrishnan. The Dean acted as the Chairman of the Scheme Advisory Committee. The Programme Officer attended the Orientation Training at Avinasilingam Home Science College, Coimbatore, from December 15, 1980 to December 26, 1980. The number of volunteers were 125. The volunteers actively participated in the several activities organised by the National Service Scheme. They assisted in the organisation of 'Eye Camp' at Othakadai on January 31, 1981. They helped in the sale of T. B. Stamps worth of Rs. 240. A Rat Eradication Campaign was organised jointly with Farmers' Training Centre at Thanichiyam

village on March 12, 1981. Three hundred rats were caught and killed and 50 kg of paddy was removed from rat holes. The volunteers helped in planting coconuts in the premises of Cheshire Home for orpahans at Austinpatti, Madurai. The volunteers and other students donated blood in the Blood Donation Campaign organised by the Blood Donors' Club of Madurai Medical College.

Further, the volunteers attended to cleaning of Siddhi Vinayagar Temple. The other activities organised were traffic control and adult education Drive against dowry, untouchability, illiteracy and drive on hygiene, child care, health care and family planning were also organised.

FACULTY OF HORTICULTURE

Admission : The College of Horticulture, Coimbatore reopened on October 22, 1980 for the second year B.Sc. (Hort) programme. The first year B.Sc (Hort.) programme commenced on January 1, 1981. Thirtynine students were admitted into the first B.Sc. (Hort.) programme. The number of students admitted into the second, third and fourth year B.Sc. (Hort.) programmes were 38, 20 and 12 respectively.

Educational Tours : The third B Sc. (Hort.) students went on a tour to Kodaikanal, Periyakulam, Kanyakumari, Courtallam, Trichi, Aduthurai, Vridhachalam and Madras from July 30, 1980 to August 8, 1980 to study horticultural crops. The third B Sc. (Hort.) students visited Nilgiris from October 4, 1980 to October 5, 1980 to study vegetable cultivation. The final B.Sc. (Hort) students visited Nilgiris from October 24, 1980 to October 26, 980 to study plantation crops. They also visited Anamalai, Kodaikanal, Madurai and Kanyakumari from November 25, 1980 to November 30, 1980 to study plantation crops. The third B.Sc. (Hort.) students were taken on a tour to Yercaud from December 20, 1980 to January 5, 1981 to study coffee crop. The final B Sc. (Hort) students went on an all-India tour to Hyderabad, Calcutta, Ludhiana, Simla, New Delhi, Bombay and Bangalore from February 16, 1981 to March 10, 1981 to study horticultural crops under different agro-climatic conditions. The students of the third B.Sc. (Hort.) class went on a tour to Anamalai from March 6, 1981 to March 13, 1981 to study plantation crops.

FACULTY OF AGRICULTURAL ENGINEERING

The College of Agricultural Engineering, Coimbatore offered B.E. (Ag) and M.E. (Ag) degree programmes. The activities of the College included research and extension education besides teaching.

Admission : Fifty students were admitted into the first year B.E.(Ag) programme. The first year programme commenced on January 20, 1981; the second year programme on October 22, 1980; third, fourth and fifth year programmes on September 1, 1980. Seven students were admitted into the first year M.E.(Ag programme and their classes commenced on October 22, 1980.

Educational Tours : The final year B.E. (Ag) students visited Viscon Ltd., V.S.T. Tillers Ltd., and National Dairy Research Institute at Bangalore, Aspee Bolo Ltd., Indian Institute of Technology and Aaray Milk Plant at Bombay, Punjab Agricultural University at Ludhiana, International Crops Research Institute for Semi-arid Tropics at Hyderabad, during their educational tour from January 31, 1981 to February 23, 1981. The fourth year B.E. (Ag) students, during their study tour from February 20, 1981 to Febraury 28, 1981 visited Institute of Hydraulics and Hydrology at Poondi, Murugappa Chettiar Trust, 'J' Farm-TAFE and National Engineering Company at Madras, Modern Rice Mill, Paddy Processing Research Centre and Solvent Extraction Plant at Thiruvarur, Soil and Water Management Research Institute at Thanjavur, Fisheries College at Tuticorin and Dryland Research Station at Kovilpatti.

Scholarships : The following scholarships were availed by the students of both B.E. (Ag) and M.E. (Ag) degree programmes:—

		U.G.	P.G.
i)	Defence Service Personnel Scholarship	1(No)	—
ii)	National Merit Scholarship	12	—
iii)	National Loan Scholarship	4	—
iv)	TNAU Merit Scholarship	11	1
v)	SC Scholarship	19	—
vi)	S C Loan Scholarship	2	—
vii)	BC Scholarship	44	—
viii)	Teachers' Welfare Scholarship	2	—
ix)	ICAR Merit Scholarship	15	—
x)	Pondicherry Government Scholarship	2	—
xi)	National Government Scholarship	1	
	Total	113	1

Students' Hostel : Forty nine final year B.E. (Ag) students, 41 fourth year B.E. (Ag) students, 40 third year B.E. (Ag) students, 35 second year B.E. (Ag) students, and 47 first year B.E. (Ag) students were accommodated in the

Hostel. The only full time M.E. (Ag) student was accommodated in the P.G. Hostel of the Agricultural College.

National Cadet Corps : Thirty five students participated in the National Cadet Corps. Eight cadets attended the annual training camp at R.S. Puram, Coimbatore, from December 24, 1980 to January 4, 1981.

National Service Scheme : Eighty three students served as volunteers. They attended to cleaning of roads, temples at Vedapatty and hostel permises. They also attended to planting trees at Hostel and Podanur. They helped the Police in traffic control at Gandhipuram and also during "Koniamman Car Festival".

FACULTY OF BASIC SCIENCES AND HUMANITIES

A three year B.Sc.(Home Science) degree programme was started in the Madurai campus. Fifteen students were admitted into the first year programme. The curriculum includes courses on home science, food and nutrition, textiles and clothing, child care, home extension education, home economics, production, preservation and processing of farm commodities and home resources management. A M.Sc. (Sugarcane Production) degree programme was also introduced in collaboration with the Sugarcane Breeding Institute, Coimbatore. Four students were admitted into the programme. The programme is a production oriented one to suit the needs of personnel involved in production and processing of sugarcane in different organisations.

FACULTY OF VETERINARY AND ANIMAL SCIENCES

Admission: The number of students admitted into B.V Sc , M.V.Sc. and Ph D. degree programmes at the Madras Veterinary College were 116, 57 and 9 respectively. The academic year commenced on January 27, 1981 for the first year students, November 10, 1980 for the second year students, November 20, 1980 for the third and fourth year students and November 12, 1980 for the July 1980 Batch of final year students, March 19, 1981 for the October 1980 Batch of final year students and Obtober 22, 1980 for the M.V.Sc. students.

Educational Tours : The final B.V.Sc. students were on an all-India tour and visited All-India Institute of Medical Sciences, Indian Agricultural Research Institute and National Institute of Communicable Diseases at New Delhi, Army Dairy Farm at Ambala, NDRI at Karnal, Veterinary College at Hissar, Punjab Agricultural University, Chandigarh, Marino Sheep Breeding Centre at Jammu, Ludhiana Agricultural University, Pantnagar Agricultural University, Amul Dairy at Anand, Deonar Slaughter House at Bombay etc.

Scholarships : The details of scholarships availed by the students are given below:

	Name of Scholarship	No. of Recipients	Amount Rs.
1.	Harijan Welfare Scholarship	101	1,49,469
2.	Harijan Welfare Loan Scholarship	59	57,410
3.	Backward Class Scholarship	171	1,18,968
4.	Backward Class Loan Scholarship	5	2,500
5.	National Loan Scholarship	17	17,215
6.	National Merit Scholarship	4	4,775
7.	National Foundation for Teachers' Welfare Scholarship	8	4,000
8.	ICAR Merit Scholarship	38	44,400
9.	Bright Student Award to Scheduled Caste Students	2	1,920
10.	Gandhi Memorial Scholarship to Scheduled Caste Students	1	1,000
11.	Adhoc Merit Government Scholarship to Scheduled Caste Students	2	600
12.	Ex-servicemen Scholarship	2	2,369
13.	Government of India Cultural Scholarship	4	13,100
14.	Jammu & Kashmir Scholarship	3	5,236
15.	Jammu & Kashmir Loan	4	8,246
16.	Andaman & Nickobar Scholarship	1	750
17.	Ponchicherry Government Scholarship	2	4 940
18	Stipend for Megalaya Students	7	2,750
19.	Stipend for Nagaland Students	1	800
	Total	432	4,40,449

Students' Hostel : Dr. S. Venkatayyan, Professor and Head, Department of Physiology acted as Warden from April 1, 1980 to October 1, 1980 and Dr. P. Kothandaraman, Professor and Head, Department of Poultry Science from October 7, 1980 to March 31, 1981. The Warden was assisted by three Deputy Wardens and administrative staff. The activities of the hostel were carried out with the assistance of student secretaries elected by the students.

Health Care : The Hygine Secretary was in overall charge of the health care of the inmates of the hostel. Periodical spraying of insecticides in the environs of the hostel was arranged to control mosquitoes. The hostel doctor visited the hostel in the morning on Wednesdays and Sundays and looked after the students.

Students' Mess : One more mess was started during the year in addition to the messes already functioning. The messes were run by the students themselves on dividing system under the supervision of the Warden. One water cooler was installed and another was purchased to be installed in the messes.

Entertainments for Students : Thirty seven musical discs were purchased and played through a net work of loudspeakers. The television set was also used to provide entertainment. Twenty four feature films were screened in the week ends.

Students' Club Activities : The elections of the office bearers of the Madras Veterinary College Students' Association were held. The Association was inaugurated on February 13, 1981 by Hon'ble Thiru P. Kulandaivelu, Minister for Local Administration, Government of Tamil Nadu. The Students Thiruvalargal Panneerselvam and Mathialagan participated in the oratorial contest conducted by the S.P.C.A., Madras and won the first prize in the team competition. The students donated blood under the voluntary blood donation scheme organised by the World University Service and ranked 6th among college students and 12th among all donors.

Sports and Games : The college teams won the foot ball and volley ball tournaments conducted by the Madras City Collegiate Athletics Association. In the hockey and ball badminton tournaments the college team got runners-up. Athletes from the College participated in the Pentathlon Championship (Men and Women) and in the Inter-Agri. Sports Meet and secured prizes. The college teams participated in the open tournaments in the city and got runners-up in the Y.M.C.A. College Diamond Jubilee Hockey Tournament organised by the Y.M.C.A. College of Physical Education, Madras. The players from the college participated in the volley ball and ball badminton tournaments organised by Thirupathi Veterinary College in connection with its Silver Jubilee Celebrations. The players became winners in volley ball and runners-up in ball badminton. The students took active part in the Intra-mural tournaments and in the Annual Sports Meet for the year 1980

Some of the college players were selected to represent the Tamil Nadu Agricultural University in hockey, volley ball, basket ball and foot ball. Thiru D. Sundararaj, Physical Director was the Manager of the Tamil Nadu Agricultural University Volley Ball Team which participated in the Inter-University South Zone Volley Ball Tournament held at Kerala University, Trivandrum.

The student members of the National Service Scheme adopted Thiruneermalai village near Madras and took part in social service activities like vaccination of fowls with RDVK Vaccine, debeaking of birds and treatment of animals and birds. Sixteen student members of the scheme took part in the

special campaign from February 23, 1981 to March 2, 1981. Treatment of animals and birds, debeaking of fowls, data collection pertaining to animal husbandry, road repairs were the activities performed.

FACULTY OF FISHERY SCIENCE

Admission : Twenty students were admitted into the first year B.F.Sc. programme at the Fisheries College' Tuticorin. The first trimesters for the first year B F.Sc. programme started on January 27, 1981.

Educatioal Tours : The fourth year B F.Sc. students went on an all-India tour for 20 days to Visakhapatnam, Calcutta, Srinagar, Delhi, Bombay and Goa. In Visakhapatnam, the students visited the Exploratory Fisheries Project, the Fishing Harbour, the plants of the Andhra Pradesh Fisheries Corporation and some establishments of the State Department of Fisheries and also saw inland fish culture. In Calcutta, they visited the Export Inspection Agency and the headquarters of tne Central Inland Fisheries Research Institute, Barrackpore. In Srinagar, they visited the Cold Water Fisheries Research Unit of the CIFRI at Harwar. In Delhi, they visited the ICAR headquarters. In Bombay, they visited the CIFE, Taraporewala Aquarium, processing establishments and Exploratory Fisheries Project. In Goa, they visited the National Institute of Oceanography. The Third Year B.F.Sc. students went on a tour for 12 days to the important fisheries establishments at Madras, Coimbatore, Ootacamund, Bhavanisagar, Mangalore and Cochin.

Scholarships : The details of scholarships enjoyed by the students during the year 1980-81 are given below :

Sl. No.	Name of scholarship	No. of students	Total amount
1.	Backward Class Scholarship	15	13,637
2.	Post-matric Scholarship for Scheduled Caste students	6	10,259
3.	S.C. Loan Scholarship	6	5,350
4.	ICAR Merit Scholarship	2	2,200
5.	National Scholarship	2	1,975
6.	National Loan Scholarship	2	1,690

Students' Hostel : Eighty students were accommodated in the hostel. The hostel affairs were looked after by a staff member who acted as Deputy Warden.

Mess : A mess was run for all the inmates of the hostel.

Entertainment for Students : Documentary films received from the Embassy of Federal Repuplic of Germany and the Consulate General of Japan were screened for the benefit of students.

Students' Club Activities : Thiruvalargal S Ravishankar and C. R. Suresh participated in the inter-collegiate debate on "Preservation of Wild life" sponsored by the Y. M. C. A., Tuticorin and got the Rolling Shield for the team championship in the contest. Thiruvalargal R. Swaminathan, S. Rubert Jothi. C. R. Suresh and G. Chandrachud won second prize in the quiz competition conducted by the Y. M. C. A., Tuticorin. The members of the Students' Club voluntarily donated blood to the fire victims. The students collected funds for fire relief and flood relief activities initiated by the Chief Minister.

Sports and Games : The students participated in the foot ball tournament conducted by the Thozhilalar Munnetra Kazhagam of Thermal Power Project, Tuticorin and won the shield. Thiruvalargal S. Ravishankar and Raja represented the college in the Tamil Nadu Agricultural University volley ball and hockey team respectively. The students also participated in the volley ball, cricket, badminton and table tennis tournaments conducted by Thermal Power Project, Heavy Water Project and Gymkhana Club at Tuticorin.

FARM SCIENCE CENTRE
KRISHI VIGYAN KENDRA, PONDICHERRY

The Krishi Vigyan Kendra at Pondicherry imparted vocational training to farmers and young school dropouts with farm backgronnd and inservice training to extension workers in agriculture, animal husbandry and fisheries and took up problem solving research programmes for the region.

The required infrastructure was provided A poultry shed was constructed in the Western Block and 200 white leghorn fowls were maintained for demonstration and training purposes. In the Eastern Block the godown was electrified and gates were fixed. The wire fence was strengthened. A small sericulture unit was established for demonstration. Measures were initiatad for effective utilisation of effluent water from breweries for fisheries. Cages were erected for rearing Brown Plant Hoppers for studying control. The third All India Workshop on Krishi Vigyan Kendra was held from August 19, 1980 to August 22, 1980. The Lt. Governor of Pondicherry inaugurated the Workshop and declared open the Information Centre. Dr. O. P. Gautam, Director-General Indian Council of Agricultural Research presided. The Vice-Chancellor University welcomed the participants. A review of KVKs was presented by the Deputy Director General (Edn), ICAR. Over 100 delegates from all over India participated in the deliberations. The delegates were taken round the Kendra Farm and the research and training activities were explained. The participants visited the Farmers' Discussion Centre at Oulgaret and Ramanathapuram and Thondamanatham villages adopted by the Kendra under Lab-to-Land

Programme The extension activities of the Kendra were explained to the delegates In collaboration with the Directorate of Agriculture, Government of Pondicherry, a seminar on Bio-gas Production Technology was held at the Kendra from January 27, 1981 to January 31, 1981. The seminar was inaugurated by Thiru V. M. C. Sivakumar, Minister for Agriculture, Pondicherry, and presided over by Thiru S. S. Mahdi, Commissioner (Fertiliser Promotion), Ministry of Agriculture, New Delhi. Thirty delegates from Andhra Pradesh, Kerala, Karnataka, TamilNadu and Pondicherry participated in the seminar. Thiru D. Ramachandran, Chief Minister of Pondicherry gave the valedictory address. On the occasion of the seminar, a Janatha Gas Plant was constructed for demonstration and training. Shri Rao Birendra Singh, Minister for Agriculture, Government of India accompanied by Thiru D.Ramachandran, Chief Minister of Pondicherry and Thiru M. Sanmugam and Thiru V. P. Munusamy, MPs visited the Kendra on October 22, 1980. The visitors were taken round the research farm and to the information centre and the research and training activities of the Kendra were explained. The visitors planted jack seedlings near the main school building. Rice breeders from Aduthurai, Coimbatore, Hyderabad, Maruteru, Pattambi and Mandya visited the Kendra on October 5, 1980 to acquaint themselves with the rice breeding work at the Kendra. Two high yielding rice varieties viz., "Puduvai Ponni" and "Punithavathi" were released earlier from the Kendra. The Kendra actively participated in the Sixth Flower Show organised by the Department of Agriculture. Farmers' Day was celebrated at the Kendra on March 23, 1981. The Minister for Agriculture inaugurated the function under the presidentship of the Vice - Chancellor, of the University.

The Chief Minister laid the foundation stone for staff quarters and inaugurated the world afforestation function.

The Chief Secretary, Government of Pondicherry, distributed certified seeds produced in the Kendra farm to farmers. More than 200 farmers from Karaikal and Pondicherry regions participated in the function.

Inservice Training

Deputy Agricultural Officers : A three-day Rabi Production Training was organised for 25 Extension Officers of the Department of Agriculture, Pondicherry. Crop production and protection techniques for rice, pulses, groundnut and ragi were covered.

Livestock Officers and Inspetcors : The sterility detection camps for milch animals organised at three villages in Pondicherry and at four villages in Karaikal were attended by more than 10 officers of the Department of Animal Husbandry.

Twenty Officers from the Department of Animal Husbandry as well as farmers participated in the training on Forage Crops organised at the Kendra.

The Bio-gas Production training organised at the Kendra was attended by 30 Officers from Andhra Pradesh, Kerala, Karnataka, Tamil Nadu and Pondicherry.

Fifty field level workers and maisthries of the Department of Agriculture were imparted training on the production techniques of important crops and integrated plant protection methods.

Farmers' Training :

Through seminars and pre-season campaigns on improved production techniques in rice, groundnut and pulses more than 1000 farmers were benefited. Two hundred farm women were trained in kitchen gardening and vegetable cultivation. The details of training imparted to farmers, fishermen and others are given below :

	Training courses	Duration (days)	No. of participants	No. of courses
	1	2	3	4
1.	Rice production technology	5	370	7
2.	Composite fish culture.	1	30	2
3.	Forage crops.	1	400	5
4.	Biogas production technology	5	30	1
5.	Cultivation of greengram.	1	20	2
6.	Sterility detection camp in milch animals - Karaikal	1	90	4
7.	Importance of pulses, groundnut and vegetables and their improved cultivation methods.	7	80	3
8.	Pest problems and control measures in rice productiyn.	5	25	1
9.	Blue green algae and its importance in fertilization	1	200	2
10.	Nutrition gardening	1	100	2
11.	Seminar on pulses cultivation-Karaikal	1	100	1
12.	Pulses production in rice fallows	1	50	2
13.	Post - harvest technology	1	20	1
14.	Sterillty detection camp in milch animals - Pondicherry	1	117	3
15.	Pre-season compaigns in rice	1	800	6
16.	Vegetable and fruit production techniques.	5	25	1
17.	Vegetable and fruit production techniques.	1	100	4
18.	Rice seedlings production techniques.	1	100	4
19.	Pest control and fertilisation in rice	2	100	2

[Contd.]

	1	2	3	4
20.	Kitchen gardening and vegetable cultivation.	1	200	6
21.	Rice, sugarcane and cotton production technology	5	50	1
22.	Integrated plant protection methods for pests of rice, millets, pulses, sugarcane and cotton.	10	15	1
23.	Rice, sugarcane and cotton production technology	5	50	1
24.	Pests of important crops in the region and their control.	1	40	1
25.	Rabi production training camp on rice, pulses and groundnut	3	25	3
26.	Tractor mechanism	180	5	1
27.	Fruits and vegetable cultivation	180	8	1
28.	Integrated pest control	180	10	1
29.	Poultry rearing and management	180	4	1
30.	Gardening	365	4	1

Farm Youths' Training:

... Five youths underwent six-months training in Tractor Mechanism.

... Eight farm youths were imparted six-months training in Fruits and Vegetables Cultivation.

... Ten farm youths were given six-months training in Integrated Pest Control.

... Training in Poultry Rearing and Management for a period of six months was given to four youths.

... Four youths got benefitted from one-year course in gardening.

... Fifteen youths underwent ten-days training in Integraied Plant Protection for rice, millets, pulses, sugarcane and cotton.

KUMARAPERUMAL FARM SCIENCE CENTRE, TIRUCHIRAPALLI

The centre has Krishi Vigyan Kendra, Agricultural Research Station, Government of India Scheme on Casuarina, Cotton Scheme for Blacksoil Area of Ariyalur, Lab-to-Land Programme, Regional Laboratory (Soil Science), Saline Sodic Soil Scheme, Salinity Centre, ORP on Dry Farming for Manapparai Red Soil Area and Ariyalur Black Soil Area and Pearl Millet Scheme. The Kendra imparted training to farmers, young school dropouts with farm background, on crop production, horticulture, dairying, goat-rearing, poultry keeping, fisheries,

forestry, home-science and food technology. Besides, problem-oriented research projects were taken up to solve problems in the region.

Training Activities: The centre imparted training to farmers and farm youths. Village and farm surveys were conducted in selected villages to plan training courses.

Village Survey: Socio-economic surveys revealed that the principal crops grown in the area were rice, banana, sugarcane, betelvine, cotton, millets, cashew, chillies and coriander.

Farm Survey: The existing level of technology was studied to identify training needs. In the first and second phases of training practical training in agricultural production was imparted. In the third phase, follow up actions were taken. Group discussions of trainees were arranged. In the final phase multiple cropping and mixed farming were taught.

The Kendra organised 172 Farm Science Clubs in 172 villages enrolling 3471 farmers. The objectives of the clubs are to organise training courses and disseminate new findings. The details are as under:

S.No.	Name of Taluk	No of farm science clubs.	No.of women farm science clubs.	No of members enrolled
1	Tiruchirapalli	16	1	314
2	Udayarpalayam	10	1	305
3	Perambalur	22	6	579
4	Manapparai	16	—	314
5	Lalgudi	25	3	502
6	Ariyalur	22	1	468
7	Kulithalai	20	1	416
8	Karur	7	2	175
9	Musiri	11	—	243
10	Thuraiyur	8	—	155
	Total	157	15	3471

Extension Education : Training courses were organised. In each cours 15 to 20 trainees participated. The training courses attracted members of Farı Science Clubs, and farm youths, farm women and higher secondary student The details of the courses are given below :

S. No.	Subjects dealth with	No. of participants
I.	*One-day training courses :*	
1.	Paddy cultivation	654
2.	Millets, pulses, oilseeds cultivation	123
3.	Cumbu cultivation	78
4.	Cotton cultivation	39
5.	Groundnut cultivation	60
6.	Coconut cultivation	126
7.	Sugarcane cultivation	192
8.	Saline and alkaline soils reclamation	240
9.	Dry farming techniques	96
10.	Plant protection	256
11.	Mango cultivation and pruning techniques	72
12.	Acid lime cultivation	64
13.	Banana cultivation	278
14.	Cashew cultivation	124
15.	Cultivation of fruit crops	116
16.	Cultivation of vegetable crops	114
17.	Cultivation of flowers	62
18.	Kitchen gardening - Model nutrition gardens	217
19.	Preservation of fruits and vegetables	139
20.	Chillies cultivation	340
21.	Onion and coriander cultivation	48
22.	Turmeric cultivation	36
23.	Betelvine cultivation	24
24.	Ornamental gardening	18
25.	Dairying, goat rearing, poultry keeping	321
26.	Farm forestry	24
	Total	3861
II.	Two-days training courses :	
	1. Paddy and sugarcane cultivation	280
	2. Horticulture and animal husbandry	420
III.	Three-days training courses :	
	On agriculture, horticulture & animal husbandry	195
IV.	Five-days training course on plant protection	30
V.	Seven-days training course on horticulture	15
VI.	Twelve-days training course on plant protection	30
VII.	One-month training courses on agriculture, horticulture and animal husbandry	80
	Total	4911
VIII.	Off-the campus training programmes on agriculture, horticulture, animal husbandry and forestry	2638

The staff members of the Centre, visited 64 villages in Tiruchi distirct and advised farmers on the following:

1. Reclamation of saline and alkaline soils
2. Plant protection in rice
3. Plant protection in cumbu and ragi
4. Plant protection in chillies
5. Pruning of mango
6. Maintenance of acid lime plantations
7. Cultivation of commercial bananas
8. Maintenance of betelvine gardens
9. Button shedding in coconut
10. Model nutrition kitchen gardens
11. Layout of ornamental gardens, parks
12. Sylviagriculture (Casuarina, Bamboos, Eucalyptus
13. Dairy farming, goat rearing, poultry keeping
14. Maintenance of cashew plantations
15. Maintenance of gobar gas plant
16. Manuring of bananas
17. "Kotta Vazhai" in bananas. (Poovan)
18. Lumpiness in rasthali
19. Pitcher system of irrigation in new orchards
20. Control of virus diseases in rice
21. Micro-nutrient application in rice
22. Wilt of banana and betelvine
23. Goat rearing in stall-fed conditions
24. Namakkal type of poultry rearing

Farmers' Day : Farmers day was celebrated on January 9, 1981. Six hundred farmers participated in the function. An exhibition was arranged jointly by the Departments of Agriculture and Animal Husbandry, TAPCO and Department of Farm Machinery, TNAU, South India Viscose Ltd, etc. A special stall was put up to sell the University books and publications besides 'Valarum Velanmai'.

Lab-to-Land Programme : Three hundred farm families (125 wetland farmers, 125 dryland farmers and 50 livestock farmers) were adopted in Ariyalur, Navalur Kuttapattu, Muthukulam, Kallikudi and Bhaganur villages. For rice, application of $ZnSO_4$ at 30 kg ha, raising blackgram as a border crop, planting 2 to 3 seedlings per hill, split application of urea at 75 kg/ha, water management (2.5 cm) and plant protection were arranged. In dry lands, sowing of blackgram, (KM 1 and Co.3) at 20 kg/ha, inoculation of seeds with rhizobial culture application of 10 kg urea, 60 kg superphosphate as basal dressing and plant protection were covered. Seedlings of coconut, grafts of mango, guava layers and acid lime seeelings were supplied to 250 farmers. Under animal husbandry

Thiru A. Venkataraman, Vice-Chancellor, addressing farmers on Farmers' Day at Coconut Research Station, Veppankulam, on Febrary 1, 1981.

Non-Conventional Training Tea-shop Discussion on Pulses and Oilseeds at Saathamangalam village during 1981.

Hon'ble Thiru P. Kulandaivelu, Minister for Local Administration participating as Chief Guest for Students' Club Inauguration, on October 11, 1980.

Hon'ble Thiru P. Kulandaivelu, Minister for Local Administration declaring open a new Dining Hall in the Agricultural Engineering College Hostel, on October 11, 1980.

Madurai Agricultural College Students Threshing Rice at the College Farm.

Madurai Agricultural College Students Transplanting Rice at the College Farm.

Madurai Agricultural College Students Puddling Rice Fields at the College Farm.

programme supply of 16 to 18 weeks' old hybrid layers, grower mash at 100 g/bird/day were arranged. Six field days, 2 kisan melas, 3 exhibitions, and 15 filmshows were conducted. Thirty landless labourers were supplied with fowls and feeding materials. Cow families were formed in Ariyavur and Navalur Kuttapattu villages and concentrates were supplied to increase milk production.

National Tree Seminar : A national seminar on tree improvement was conducted on January 8, 1981. Fifty six delegates from all over the country attended the meeting. The Director of Extension Education of the University presided. Thiru T. Achaya, I. F. S., Chief Conservator of Forests, inaugurated the seminar and presided over the plenary seasion Prof. J. Wilson, Professor and Head, Department of Forestry of the University welcomed the gathering and presented a resume of the tree improvement work in the University. Sessions on Eucalyptus, Casuarina, Teak and other species were covered. The Principal of the Centre, proposed vote of thanks. Thiru S. Shyam Sunder, Conservator of Forests, Research Circle, Karnataka State proposed vote of thanks on behalf of the delegates.

4. RESEARCH

The research activities of the Scientists at Coimbatore, Madurai, Madras and Tuticorin campuses and at the various research stations and centres and Krishi Vigyan Kendra during 1980-81 are furnished in the Appendix I.

5. EXTENSION EDUCATION

The activities of the Directorate of Extension Education were strengthened by the starting of three plant clinics in the State. The clinics were useful in solving the problems of farmers and served as feed back for the research programmes of the University. The adaptive research trials conducted by the Farmers' Training Centres and other Units were useful in identifying innovations suitable for the different agro-climatic regions of the State.

The extension education activities of the University were carried out through Training Programmes, Communication Centre, Farmers' Training Centres at Coimbatore and Madurai, Krishi Vigyan kendra at Trichy and Pondicherry, National Demonstration Scheme at Madurai and Vellore, Extension Centres at Aduthurai, Virudhachalam and Kovilpatti, Extension activities of the staff of the campus and research stations, Plant Clinic Centres at Vellore, Kanchipuram and Tirunelveli, Adaptive Research Trials and Lab-to-Land Programme through Farmers' Training Centres.

TRAINING PROGRAMMES

A series of training programmes were organised during the year. Minikit programmes for rice, sorghum, bajra and pulses were conducted. Besides, training programmes in post-harvest technology, pest control in cotton, dry farming and water management were conducted for the staff of development departments from the states of Tamil Nadu, Andhra Pradesh, Kerala, Karnataka and Maharashtra.

A training programme in horticulture and forestry was conducted for 23 railway employees A training programme for the teachers of vocational courses in higher secondary schools was conducted in the fields of crop production, crop protection and small farm management.

Rural Developmrnt Officers of the State Bank of India and Technical Officers of Bank of Baroda, attended training programmes organised for them. Training programmes were also conducted for I.A.S. probationers, Deputy Collectors and Deputy Registrars of Co-operative Societies. Twenty I.A.S. probationers from various states and 8 I.A.S. probationers of Tamil Nadu cadre were trained for a period of 12 days. Dairy Development Officers attended a training programme in fodder production.

COMMUNICATION CENTRE

The Communication Centre disseminated the findings of the University in the form of 370 popular articles in English and Tamil through mass media like newspapers, farm journals and radio broadcast.

Farmers' Enquiries: Enquiries from farmers numbering 1870 were answerad directly. Replies for 1258 questions were broadcast by the AIR Coimbatore. Radio features numbering 102 were recorded in the University Radio Recording Studio and were broadcast by AIR Coimbatore, Madras and Tiruchirapalli.

Correspondence Course: Four correspondence courses were offered. The details of the courses are given below:

S No.	Period	Subject	No enrolled	No. attended contact programmme
1.	Apr.-Jun.'80	Flower Cultivation	55	15
		Dairy Farming	108	47
2.	Jul.-Sep '80	Rice Cultivation	49	19
		Sericulture	91	31
3	Oct.-Dec '80	Sugarcane	88	28
		Cotton	40	19
4	Jan. Mar '81	Poultry	105	34
		Turmeric	14	3
		Total	550	196

The successful participants were given certificates at the end of the contact programme.

Farm School on AIR Programme: The Farm School on Air Programmes are listed below:

S.No.	Period	Subject	No. of lessons	No. of farmers registered	No attended the contact programme
1.	Apr.-Jun.'80	Fruit Cultivation	13	440	84
2.	Jul.-Sep.'80	Oilseeds	13	248	84
3.	Oct.-Dec '80	Water Management	14	246	92
4.	Jan.-Apr.'81	Fertilizers	14	660	150
		Total		1594	410

Certificates were given to the successful candidates on the occassion of one day cotact programme. Several demonstrations were arranged for the benefit of the participants

Pest Surveillance : Pest surveillance reports were arranged to be broadcast by AIR every week. Forecasts of packages of practices for rice, cotton, sorghum and groundnut were broadcast twice a week by AIR Coimbatore for the benefit of farmers of Coimbatore, Salem, Periyar and Dharmapuri districts

Exhibition : The University participated in the Tourist Trade Fair at Madras, Science Exhibition at the Engineering College, Guindy and Summer Exhibition at Coimbatore.

Lab - to - Land Programme : The programme helped 3,000 small and marginal farmers. The programme was implemented through Farmers' Training Centres, Krishi Vigyan Kendras and Extension Centres.

Seed Production Programme : Under this programme breeders' seeds produced at the Agricultural Research Station, Bhavanisagar were supplied to the State Department of Agriculture, National Seeds Corporation, seed producers and progressive farmers. During the year 30.42 tonnes of seeds valued at Rs. 99,787 were sold through the Seed Depot at Coimbatore. Breeder's seeds worth of Rs. 1.2 lakhs were sold from the Bhavanisagar Station Certified seeds were produced at Coimbatore, Madurai. Aliyarnagar and Srivilliputhur and supplied to State Department of Agriculture for multiplication and distribution.

PLANT CLINIC CENTRES

Plant Clinic Centres with laboratory facilities were started at Vellore, Kancheepuram and Tirunelveli. The staff of these centres were provided with motorcycles for quick diagnosis of pests and diseases in the remote villages.

Farmers' Training Centres : The activities of the Farmers' Training Centres at Coimbatore and Madurai are summarised below:

Village Seminars : Location-specific village seminars on rice, millets, oilseeds, pulses, forage crops, cotton, sugarcane, tapioca, vegetables, chillies, flowers, tree crops, sericulture biogas plants, animal husbandry, dry farming etc., were conducted by the Farmers' Training Centre at Coimbatore, covering all the Panchayat Unions in the district. The village seminars dealt with current problems. The Specialists of the University participated in the seminars During the period under report 20 village seminars were donducted benefitting about 1276 farmers.

The Farmers' Training Centre at Madurai conducted 21 village seminars on the management of crops and livestock benefitting about 2900 farmers.

Peripatetic Demonstrations : One hundred peripatetic demonstrations on new varieties, improved agronomic practices, mixed cropping, post harvest technology, kitchen gardening, biogas plants, improved implements, home science etc were conducted by the Farmers' Training Centre at Coimbatore benefitting about 2344 farmers.

The Farmers' Training Centre at Madurai conducted 100 peripatetic training programmes on techniques in agriculture and animal husbandry benefitting about 2030 farmers.

Adaptive Research Trials : Twelve Adaptive Research Trials were laid out by the Farmers' Training Centre at Coimbatore. Trials on cotton hybrids and varieties, maize, pulses, gingelly etc , were laid out. The convenor of the Farmers' Discussion Group was also associated in this programme. Twelve trials were laid out by the Farmers' Training Centre at Madurai.

LAB-TO-LAND PROGRAMME

The Farmers' Training Centre at Coimbatore carried out the lab-to-land programme. The programme benefitted 750 small/marginal dryland farmers in three villages (Veerapandi, Chinnathadagam, Nanjundapuram) in Coimbatore district. Some of the characteristics of the farm families are given below :

Farm size in ha	Scheduled castes	Scheduled tribes	Backward community	Total	%
0 5 to 1.0	24	78	251	353	47
1.0 to 1.5	13	98	203	314	42
1.5 to 2 0	3	24	56	83	11
Total	40	200	510	750	—

The details of assistance to farmers are given below :

Seeds	Varieties	Qty	Value
Cholam	Co 23,Co 24	2960 kg	6,390
Cumbu	KM 2	801 ,,	5,607
Thenai	Co 5	205 ,,	225
Ragi	PR 202	500 ,,	1,265
	Indaf 5	32 ,,	48
Cowpea	C 52	4584 ,,	17,235
	Co 3	555 ,,	1,942
Soybean	Co 1	62 ,,	108
Blackgram	T 9 KM 1, Co 4	532 ,,	2,088
Bacterial culture		484 ,,	822
Super phosphate		37.5 tonnes	30,540
BHC 10% + DDT 5%		1812 kg	2,382
Digging forks		266 kg	13,065

Three villages were adopted by the Farmers' Training Centre at Madurai under the Lab-to-Land Programme and inputs like fertilizers, neem cake, and pesticides were distributed to the adopted farmers of these villages. One hundred and forty six adopted landless labourers were given 10 poultry birds each for rearing.

Other Training Programmes : Two-days training programmes for small/marginal farmers of Coimbatore district were conducted every month in co-operation with SFDA. Twenty training programmes covering all the development blocks were organised and about 1460 farmers were benefitted. Farm management techniques suited to small/marginal farmers were explained and method demonstrations on improved practices conducted. Farmers' visits to the University campus were arranged.

Training on Pulses Production : Twenty one-day training programmes sponsored by the State Department of Agriculture were organised by the Farmers' Training Centre at Coimbatore to boost the production of pulses. In each training, 75 to 110 farmers participated and the improved techniques in pulses production were explained to them. They visited the pulses trial plots at the Coimbatore campus.

Three training programmes were conducted by the Farmers' Training Centre at Madurai and 110 convenors of FDGs attended the training.

Compact Block Demonstration : One Compact Block Demonstration on rice was laid out in Thanichiyam village of Madurai district.

OTHER FARMERS' CONTACT PROGRAMMES

Farmers' Day : A Farmers' Day was organised in the first week of April 1980 at the Agricultural Research Station at Bhavanisagar. Discussions on improved varieties, improved implements, water management and marketing of agricultural produce were held. More than 1000 farmers participated in the function. An exhibition was also arranged by the Farmers' Training Centre at Coimbatore. Method demonstrations on improved practices were conducted. Farmers visited experimental fields. The specialists of the University cleared farmers' doubts.

Crop Days and Field Days : Functions like Rice Day, Millet Day, Pulses Day, Forest Day, Farm Management Day etc., were organised by the Farmers' Training Centre at Coimbatore and 796 farmers, and several University specialists participated in group discussions.

Tours : Educational tours for FDGs' convenors were organised by the Farmers' Training Centre at Coimbatore.

In Cumbu, culture UCH 9 was found to give higher yield than X 4, KM 2, the yields being 2625, 2400 add 2300 kg/ha respectively.

The trials on redgram laid out by the Trichy centre revealed that culture S 80 gave higher yield than Co. 3, the yields being 973 and 940 kg/ha respectively under irrigated conditions.

In greengram trials, it was observed that culture M 2 gave higher yield than Co 3 and ADT, the yields being 906, 799 and 757 kg/ha respectively at Trichy centre.

In gingelly trials, culture TNAU 3 was found to perform better than TMU 3 and TMU 5 at Trichy centre.

The trials on groundnut laid out by the Vridhachalam centre revealed that the variety Co 1 was found to give higher yield than Mutant - 3, TMU. 12, the yields being 350, 250 and 250 kg/ha respectively under rainfed conditions.

The trials on cotton at the Madurai centre revealed that culture ELS 527 gave higher yield than ELS 525, MCU 9 and MCU 5. The yields were 2075, 2020, 1845 and 1655 kg/ha respectively. In hybrid cotton, culture NHHB 134 was found to perform better than NHHB 37 and Varalakshmi, the yields being 2020, 1885 and 2000 kg/ha respectively, at Madurai centre.

6. FINANCE AND ACCOUNTS

The following statement indicates the classified summary of the transactions of the University during 1980 - 81 :

			(Rs in lakhs)
1.	Opening Balance as on 1-4-1980		122.21
2	**Receipts :**		
	Grants : State Government		
	Agriculture Grant	292.15	
	Veterinary Grant	185.71	
	Fisheries Grant	30.73	
			508.59
	I.C.A.R. Grant		
	For Agricultural Research Schemes	128.15	
	Development Grant	33.29	
	Veterinary Research Schemes	5 64	
	Grant to K. V. K. Pondicherry	8.13	
			175.21
	G.O.I. Grant		
	For Agricultural Research Schemes	8.90	
	Veterinary Research Schemes	0.34	
			9 24
	Outside Agencies		
	For Indian Agencies Research Schemes	4.91	
	For Foreign Agencies Research Schemes	3.36	
	National Service Scheme	0.41	
			8.68
	Other Receipts		
	Agriculture : Fees, Rent, Farm Receipts etc.	68.90	
	Veterinary : Fees, Rent, Dairy Receipts etc.	19.19	
	Fisheries : Fees, Rent, Other Receipts etc.	0.51	
	Other Deposits, Scholarships etc.	30.63	
	Loans and Advances	21.23	
	State Loan for H.B.A.	25.00	
			165.46
		TOTAL	989.39

EXPENDITURE

		Rs. in lakhs
1.	University Offices	34.[illegible]3
2.	Estate Office	28.43
3	Capital Works	27.55
4.	Agricultural College & Research Institute, Coimbatore	59.36
5.	Fauulty of Horticulture, Coimbatore	20.60
6	Faculty of Basic Sciences & Humanities, Coimbatore	21.13
7.	School of Genetics, Coimbatore.	26 59
8	Centre for Agrl. & Rural Development Studies, Coimbatore	10.11
9.	College of Agrl. Engineering, Coimbatore	19 49
10	Agricultural College & Research Institute, Madurai	58.[illegible]3
11.	Agricultural Research Stations and Centres	71.10
12.	Krishi Vigyan Kendra, Pondicherry	8 13
13.	I.C.A R. Schemes including Development Grants	153.82
14.	Outside Agencies Research Schemes	8.01
15.	G. O I Research Schemes	6 64
16.	Veterinary College, Madras	123 44
17.	Veterinary Research Stations, Centres and Schemes	61.81
18.	Fisheries College, Tuticorin	28.07
19.	Pension Fund Account	15.00
20.	National Service Scheme	0 33
21.	Loans and Advances and Deposit Transactions etc.	38.15
22.	House Building Advance Account	25.00
	TOTAL	845.32

Closing Balance as on 31-3-81 : (989.39 – 845.32) = 144 07 Lakhs.

The Finance Committee has to consider the proposals for the Revised Estimate for 1980 - 1981 and Budget Estimate for 1981-82 of the Tamil Nadu Agricultural University and recommend the Estimate to the Board of Management. The Annual Audited Accounts for the year 1979-80 have already been placed before the Board of Management.

Outside Agencies' Contribution during 1980 - 81 : The following Outside Agencies came forward to conribute funds to carry out the research as indicated against each :

	Name of Agencies	Name of the Research Project
1.	United States - PL. 480 Department of Agriculture	Scheme for Land and Water Use Planning of Water Shed.
2.	Southern Petro - Chemical Industries Corporation Ltd., Madras.	Scheme for Studies on the Fouling Problem of Cooling Towers and its Control.
3.	Hindustan Lever Ltd., Bombay	Scheme for Research on Integrated Control of *Spodoptera* (Prodenia) *litura* on Cotton and Chillies
4.	The Central Coir Research Institute, Coir Board, Kerala State.	Scheme for Utilisation of Coir Pith as Manure in Agricultural Farms.
5	C. S. I. R. New Delhi	Scheme for Biology, Fishery and Culturability of Commercially Important Crab *Scylla serratum*

Scholarships : The scholarships offered by the following organisations were accepted :

	Name of the Donor	Courses to which offered / No. of scholarships	Amount Rs.
1.	Lodge Concord G. K Devarajulu Education and Charity Trust, Coimbatore	B Sc. (Ag) Degree Course - 3 Nos.	1100/- per annum each
2.	E I D. Parry (India) Ltd , Madras	B Sc. (Ag) Degree Course - 3 Nos.	1200/- per annum each
3.	The Alkali and Chemical Corporation of India Ltd., Madras.	M Sc. (Ag) (Agronomy) - 2 Nos.	300/- p. m. each for 2 years
4.	Voltas Ltd Madras	M Sc. (Ag) (Entomology) - 1 No	300/- p. m. for 2 years.
5	M.s. Indofil Chemicals, Madras.	M. Sc. (Ag) (Agronomy) - 1 No.	400/- p.m. for 2 years
6.	M/s. Bayer (India) Ltd., Madras.	M. Sc (Ag) (Entomology) - 2 Nos.	500/- p.m. each for 2 years.
7.	M/s Shaw Wallace and Ltd,,	Ph. D. (Agronomy) 1 No.	500/- p.m. for 2 years.

Grants-in-Aid by the Tamil Nadu Agricultural University : Grants or Subscriptions were paid to the following Institutions during 1980 - 81.

		Rs.
1.	The Fertilizer Association of India	1000/-
2.	Association of Indian Universities, New Delhi	5000/-
3.	Inter-University Sports Board, New Delhi	1250/-
4.	Indian Agrl. Universities' Association, New Delhi	3000/-
5.	Students' Club of Fisheries College	500/-
6	Staff Club, Madurai	500/-

University Budget Estimate for 1981 - 82

The Annual Financial Estimates of Tamil Nadu Agrl. University have been approved by the Finance Committee / Board of Management for a gross appropriation of Rs. 1025 07 lakhs (including I. C. A. R., G. O. I. and other Agencies' Schemes).

A snm of Rs. 628 53 lakhs is expected as grant from the State Government to the University for the year 1981 82 for implementing various educational and research programmes and also extension activities. Grants from I C.A.R. will be about Rs. 233.84 lakhs including I.C.A.R. Development Grant. Grant of Rs. 21.95 lakhs is expected from the G O. I and Other Agencies. Other University receipts will be in the order of Rs. 82.45 lakhs approximately.

Audit

The Audit Certificate for 1978 - 79 has been sent to the I. C. A R. and G. O I. for almost all the schemes sponsored by them. The audit of General Fund Accounts of the University upto 1979 - 80 has been completed The general result of the audit is satisfactory.

APPENDIX I

RESEARCH

The highlights of research of the University for the year 1980 are given in the following pages. The findings included came from a large number of research projects designed to solve field problems in the faculties of Agriculture, Horticulture, Agricultural Engineering, Animal Science, Fisheries, Forestry and Humanities. The information contained will be useful to scientific and extension personnel engaged in the task of advancing agricultural knowledge for the benefit of the farming community.

CONTENTS

INTRODUCTION 1

RICE

- Crop Improvement 15
- Crop Management 33
- Soil Management 36
- Biological N Fixation 40
- Crop Physiology 43
- Crop Protection 46

MILLETS

SORGHUM

- Crop Improvement 54
- Crop Management 57
- Crop Protection 61
- Seed Technology 63

CUMBU

- Crop Improvement 65
- Crop Protection 66

RAGI

- Crop Improvement 68
- Biochemistry 70

MAIZE

- Crop Improvement 73

WHEAT 73

MINOR MILLETS 75

OILSEEDS

- Crop Improvement 78
  - Groundnut 78
  - Gingelly 79
  - Sunflower 80
  - Coconut 81
- Resistance Breeding 82
  - Groundnut 82
  - Gingelly 82
  - Sunflower 82
- Soil Management 83
  - Gingelly 83
- Crop Management 84
  - Groundnut 84
  - Sunflower 84
  - Coconut 85
- Crop Protection 86
  - Groundnut 86
  - Sunflower 88
  - Castor 88
  - Coconut 88
- Physiology 90
  - Groundnut 90
- Biochemistry 91
- Microbiology 91

PULSES

- Crop Improvement 94
  - Redgram 94
  - Blackgram 96
  - Greengram 97

Cowpea 101
Bengalgram 105
Horsegram 106
Lab Lab 107
Soybean 108
Cluster Beans 109
Resistance Breeding 109
Soil Management 110
Crop Management 113
Crop Physiology 114
Crop Protection 116
Seed Technology 117

COTTON

Crop Improvement 124
Resistance Breeding 128
Crop Management 129
Crop Protection 130

HORTICULTURAL CROPS

FRUITS

Crop Improvement 133
Crop Management 133
Soil Management 136
Management of Insect pests 136

VEGETABLES

Crop Improvement 138
Crop Management 144
Soil Management 144
Crop Protection 146

FLOWERS

Crop Improvement 152
Agro-Techniques 154

SPICES AND PLANTATION CROPS

Crop Improvement 158
Crop Management 159
Soil Management 162
Pest Management 163
Disease Management 166

AGRICULTURAL ENGINEERING

Soil and Water Conservation 171
Farm Machinery 174
Agricultural Processing 178
Agricultural Structures 179

ANIMAL SCIENCES

Cattle 182
Sheep 183
Poultry 187
Swine 190
Dogs 190

FORAGE CROPS

Cumbu Napier hybrids 191
Lucerne 191
Fodder Sorghum 192
Tree Fodder 193
Nutrition Trials 193

SOILS

Physical properties 195
Soil Fertility and Plant nutrition 196

AGROCLIMATOLOGY 201

SERICULTURE

Mulberry Silk worms 207
Eri Silk worms 210

APICULTURE 211

CELL BIOLOGY 213

FORESTRY 215

FISHERY SCIENCE 221

MATHEMATICAL MODELS FOR BIOLOGICAL SCIENCES 223

RURAL DEVELOPMENT STUDIES 231

INTRODUCTION

In 1980 also the research efforts continued to be problem-oriented and multi-disciplinary to facilitate rapid agricultural and rural development. The TNAU with its multi-campus and multi-faculty organisational structure is carrying out intensive research and extension, besides offering courses a t the under-graduate and post-graduate level, in all its constituent Colleges and faculties of Agriculture, Horticulture, Veterinary, Agricultural Engineering and Fisheries, School of Genetics, Faculty of Basic Sciences and Humanities, and Centre for Agricultural and Rural Development Studies. In addition, the Regional Research Stations and Centres located in different parts of Tamil Nadu were engaged in tackling region-specific farming problems besides providing contact points for research verification and confirmation for the technologies developed in the University and elsewhere. For effective and quicker transfer of technology, these Research Stations also involved themselves in 'on-farm' research, operational research and demonstrations. There were about 1800 research projects in operation at 35 centres in various branches of Agricultural Sciences under the All India Coordinated Research Projects and Schemes financed by the State Government, ICAR, UGC, DST, DES, IAEA and other public and private foundations and agencies.

RESEARCH THRUST

The major research thrust during the year was on the following :

... Research in cropping system with an accent on multiple, relay and bund cropping.

... Intensification of pulses and oilseeds research.

... Development of crop varieties resistant to pests and diseases.

... Operational research in water management, dryland farming, low-cost technology, integrated pest management and poultry diseases.

... Emphasis on bio-fertilizers research.

... Studies on alternate sources of energy.

... Markets and marketing system studies for policy alternatives and strategies for efficient marketing of farm produce.

... Organisation of Seminars at National and State levels to bring about interaction of ideas in various disciplines.

... Upgrading/starting Regional Research Stations and sub-centres in different agro-climatic zones in the State.

... Establishment of Rural Observatories to monitor socio-economic changes in the rural areas.

MAJOR ACHIEVEMENTS

Crop Improvement

The following ten new varieties were released during the year :

○ Co H 3, a sorghum hybrid for irrigated and rainfed conditions with the following respective yield potentials : 6088 and 2804 kg grain and 26.5 and 19.6 tonnes of straw/ha.

○ Co 5, a pure line selection of blackgram with higher yield and shorter duration than Co 3 and Co 4, and resistant to yellow mosaic.

○ 'Marutham', a tomato mutant with an yield potential of 50 t/ha.

○ PKM I, a mango clonal selection yielding higher than the local 'Neelum' variety.

○ PKM I, a sapota clonal selection with a mean yield of 3547 fruits/tree/year.

○ Co 1 radish variety with 21% higher yield over that of the 'Pusa Rashmi'.

○ Co 3 amaranthus variety suitable for continued clipping, and capable of yielding 30716 kg of greens/ha/year.

○ Two Hibiscus varieties, 'Thilagam' and 'Punnagai': the former with carmine red dianthus type double flower and the later with attractive apricot yellow flower.

○ VRI 1 cashew variety adapted to entire Tamil Nadu with an yield potential of 7.12 kg of nuts/tree/year.

In addition, the following promising cultures were identified :-

Rice

○ Rice culture DPI 591 combining fineness of grain and high yield potential.

○ High yielding elite rice cultures like TNAU 20027/1 (99 days), TNAU 6464 (100 days), IET 2361 (117 days), DPI 648 (128 days) and IET 5898 (160 days) for testing under different 'on - farm' situations.

○ Rice variety TNAU 7124 resistant to bacterial leaf blight disease with an yield potential of 5-6 t/ha.

○ Rice cultures TNAU 17005 and TNAU (AD) 98 highly resistant to blast and IET 6262 to tungro virus.

○ TNAU 17005 rice with highest survival percentage for salt, and culture DPI 594 for alkali.

Millets

○ Sorghum cultures USV 6, USV 7, USV 9 and USV 10 resistant to downy mildew, head mould, leaf blight and rust, and cultures USV 8, USV 9 and USV 10 to shootfly and stemborer.

○ A new cytoplasmic genic male sterile line of cumbu of indigenous origin resistant to rust disease.

○ Maize hybrid UMH 3 resistant to downey mildew besides being early and high yielding.

Oil Seeds

- Three groundnut selections PPG 2, PPG 3 and PPG 4 resistant to rust.

- The groundnut accessions AH. 35, 6677, 7043 and 7284 tolerant to the infection of ring mosaic crossed with *Arachis villosulicarpa* to incorporate the properties of high yield and resistance to mosaic.

- TG 14 and H2-14 accessions tolerant to drought were used to incorporate drought tolerance in the existing high yielding varieties.

- Early maturing groundnut selections VG 1 and VG 4 screened at Vriddhachalam.

- A bunch groundnut culture Mutant 3 derived from treatment of POL 1 with EMS capable of yielding a mean yield of 20 q/ha.

- Coconut Hybrid East Coast Tall x Ayiramkachi recorded a mean yield of 110 nuts/palm/year accounting for 34 per cent increase over East Coast Tall variety. Hybrid East Coast Tall x Dwarf Green yielded 104 nuts/palm/year recording 27 per cent higher yield.

- Gingelly culture TNAU 2 recorded 792 kg/ha during summer registering 34 per cent increase over TMV 3; under rainfed situations also the yield was higher than TMV 3.

- Sunflower culture SUF 2 with a maturity period of 60 days and yield potential of 9 q/ha under rainfed conditions

Pulses

- Redgram culture S 80 with semi-spreading habit, 130 days duration and suited for both irrigated and rainfed conditions with 17 per cent increased yield over Co 3.

- Blackgram C5-61-1, a hybrid derivative with 75 days duration and suited for rice fallows yielding 1015 kg/ha as against 770 kg/ha by ADT 2.

- Greengram Mutant 2 with a duration of 85 days and yielding 47 per cent more than Co 3.

Cotton

○ Cotton cultures ELS 525 and 527 (155-160 days), RF 5-2 and 5-3 (135-140 days) with higher yield than MCU 7 and better suited to rice follows

○ Hybrids TNHB124 and TNHB 37 with 155-165 days duration, yielding higher than 'Varalakshmi'.

Farm Forestry

○ A spontaneous thornless mutant spotted out in *Prosopis juliflora* which will be of immense value as a live fence in house compounds and an excellent fuel tree.

Horticultural Crops

○ A diploid banana for home gardens with red fruit skin, medium-tall, shorter in duration and higher ratooning potential.

○ Ribbed gourd, LA 2 an induced mutant from H 160, gave an yield of 25 t/ha in 160 days.

○ A hybrid in onion AC 885 developed for the first time, with an yield potential of 19 t/ha in 60-65 days registering 22 per cent increase over Co 3 onion.

○ 'Mullai' Selection LR with a long corolla tube and bold bud capable of yielding 8802 kg of flower buds/ha

○ 'Jathi Mullai' clone JG 3 with a record yield of 10152 kg flowers / ha and with oil yield of 29.4 kg/ha.

Forage Crops

○ Three promising Cumbu-Napier hybrid cultures TNAU BN 1, TNAU BN 2 and TNAU BN 3 superior in yield to NB 21 and BN 2

○ One high yielding culture F. Sorgh. 1 recorded 49 t/ha green fodder in 55 days.

○ An improved sunnhemp selection SS 1 possessing higher green matter and nitrogen content than the local type was identified.

○ 'Hawaian Giant' variety of *Leucaena leucocephala*, a tree fodder crop recorded 47 t/ha of green fodder/year.

Soil Management

○ Efficiency studies on organic and inorganic amendments in sodic soils revealed that the combination of press mud at 50 t/ha and $ZnSO_4$ at 40 kg/ha recorded 74 per cent increased yield in ragi over control.

○ Radish could be grown with irrigation water of high salinity hazard (EC = 6.9 mmhos/cm) through the use of press mud 30 t/ha with an yield of 181 q/ha of wet tubers as compared to 131 q/ha in control.

○ In sorghum, application of ferrous sulphate at 100 kg/ha with 12.5t FYM/ha superimposed over NPK at 90:45:45 kg/ha in an iron-deficient soil registered an yield of 2153 kg/ha, an increase of 49 per cent.

○ Inoculation of Azospirillum and blue green algae either alone or in combination resulted in a saving of 35% N in rice. Application of FYM increased the nitrogenase activity in Azolla.

○ Co 4 blackgram inoculated with multistrains of rhizobium increased the yield by 195% over control. Multistrain rhizobial inoculant gave seed yield of 627 kg/ha in Co 3 greengram and 725 kg/ha in Co 3 cowpea.

Crop Management

○ Studies on nursery techniques in sorghum indicated that super seedlings raised in sand + FYM medium gave the highest yield of 4590 kg/ha and that the seedlings could be retained in the nursery for 24 days as against 18 days for the conventional method.

○ Cocoa could be successfully intercropped with coconut. Variety Criolla came to bearing in five years yielding 25-30 fruits/tree. A population of 250 cocoa trees could be maintained/hectare.

○ Blackgram as a mixed crop with sunflower in 6 : 2 ratio recorded highest returns over pure crops of sunflower, sorghum, maize and groundnut.

○ Adoption of moisture conservation practices by middle of November such as opening up of furrows at first interculture and tying the ridges considerably increased the yield of rainfed cotton.

○ Siamate at 4.0 kg a. i./ha was effective in controlling the weeds in sunflower.

○ Chemaid, a chemical defoliant, at 2.5 l/ha applied at 80% boll opening gave the maximum seed cotton yield of 21.6 q/ha with earliness in maturity by a week.

○ Pineapple was a suitable intercrop in new coffee plantations in the first 3-4 years and under pear trees on the Shevaroy hills. Pineapple suppressed weed growth, maintained soil fertility and controlled soil erosion.

○ July planting of Mysore Cardamom gave 88 per cent establishment at 1300-1500 m elevation.

○ Espacement at 40 x 40 cm in *Mentha citrata* gave maximum herbage yield.

Seed Technology

○ A planting ratio of 6 females to 2 males was optimum in sorghum CSH 5 for seed production.

○ Seed yield of cumbu hybrid was significantly increased in the April - June season.

○ Redgram Co 2 seeds dried to 8 per cent moisture and treated with Captan and packed in moisture vapour proof container recorded 86 per cent germination at the end of 20 months of storage.

○ Chilli seeds dried to 6-7 per cent moisture content and dusted with Captan or Thiram could be stored for 20 months in a moisture-vapour proof container.

○ Seed dormancy in sunflower EC 68414 variety was observed up to 40 days after harvest. This was overcome by treating the seed with ethrel 200 ppm for 8 hr.

○ Foliar spray of planofix at 5 ppm at the begining of stray flowering followed by topping around 80 to 90 days after sowing, depending on duration contributed to 13-34 per cent increased yield in irrigated cotton.

Crop Protection

○ In controlling the rice bph, bendiocarb, isofenphos and MIPC were consistently effective. Operational research on the management of bph was undertaken successfully in farmers' fields near Vadipatti and Andipatti in Madurai district using light traps, water management, augmentation and conservation of natural enemies such as *Coccinella*, *Cyrtorrhinus* and *Lycosa* and minimal use of pesticides.

○ Application of carbofuran 50 SP at 5 per cent a.i. or isofenphos 5 G at 2 g/meter row was effective in controlling sorghum shoot fly.

○ In the control of cotton bollworms, synthetic pyrethroids were significantly superior. Infestation of bollworm was lowest in cypermethrin (9.8 per cent) followed by fenvalerate (13.0 per cent) treatment.

○ The green peach aphid on chillies could be effectively controlled by high volume spraying of methomyl 90 per cent WP at 0.1 per cent and cent per cent mortality was obtained in 72 hr.

○ Application of aldicarb granules at 0.75 kg a.i./ha on 10th day after sowing followed by three sprayings with either endosulfan 0.05 per cent or monocrotophos 0.04 per cent or phosalone 0.1 per cent at 10 days interval starting from 40th day after germination controlled fruit borers of bhendi.

○ As a curative measure to control mango stem borer, injecting 20 ml of 0.1 per cent dichlorvos and then plugging the boreholes with wet earth recorded 100 per cent mortality of grubs.

○ Nematodes infesting acid lime could be effectively controlled by soil application of aldicarb (80 g/tree) or carbofuran (200 g/tree).

○ Mass culturing techniques of rice brown planthopper, leaf folder and white-backed planthopper were standardised and resistance rating system in rice was developed.

○ Spraying Hinosan 0.1 per cent controlled the rice brown spot disease effectively.

○ Ridomil followed by Bordeaux mixture, Daconil and Fytolan were highly effective in controlling the wilt disease in betelvine.

○ For checking the spread of chilli mosaic disease, spraying dimethoate 0.5 per cent or monocrotophos 0.05 per cent six times at fortnightly intervals commencing from 3 weeks after planting or spot application of carbofuran or phorate granules at 1.5 kg a. i. / ha twice was effective. Bavistin or Vitavax seed treatments eradicated the wilt pathogen in chillies from seed and resulted in good growth of the plants and higher yield.

Food TechnoloGy

○ A formula for tomato soft drink with 10° brix, 0.5 per cent acidity and 0.3 per cent salt was standardised. Methods were developed to make tasty pickles with ashgourd and cucumber.

Agricultural Engineering

○ Biogas plants without dome, suited to different family sizes with local material were developed.

○ Chopped parthenium with cowdung and old slurry (1:4:1) maximized gas generation.

○ Solar drier, solar cooker and cabinet drier were designed to harvest solar energy for agricultural and domestic uses.

○ A tractor-drawn bed former was fabricated using 8 g. m. s. sheet with suitable hitching pins and top link hole for attaching to a tractor.

○ A multipurpose tool bar was developed to which various implements like Melur ploughs, harrows, ridger and bund former could be attached.

○ An outlet structure called the riser valve for low pressure pipe lines irrigation system was developed and field tested.

○ Size of threshing floor and drying floor for holdings of 5, 10 and 15 ha size was standardised.

○ A dehusking machine for arecanut, and a poultry feed pelletizer were designed.

Animal Sciences

○ Lactation was successfully initiated in sterile animals by hormone treatment.

○ Ultrasonic message was found to be useful in restoring milk production in cows after curing the mastitis affected animals with antibiotics.

○ A cheap semen freezer made of thermocole measuring 40x25x27 cm and a freezing rack made of stainless steel was fabricated and successfully used in freezing semen.

○ The new finewool breed 'Sandy' produced 1.5 times more and better quality wool than the native Nilgiris sheep.

○ The effect of age on greasy fleece yield and wool quality in exotic Merino-Nilgiris cross breds revealed that the age of the sheep had significant influence on wool yield and staple length but not on fibre diameter.

○ Studies on the possibilities of utilising unconventional source of feed in sheep indicated that *Avicennia* meal could be incorporated upto 50 per cent of normal ration. *Sargassum* meal (sea weed) could also be incorporated upto 20 per cent of the concentrated mixture.

○ In poultry, supplementation of vitamin through water improved the fertility and hatchability of eggs in broiler breeds.

○ Rice polish could replace maize upto 40 per cent in the chick ration.

○ *Vasambu* (*Acorus calamus*) was found effective against poultry lice and feather mites at 1 per cent suspension.

○ Infection by the parasite *Ancylostome* in dogs resulted in diahorrea.

Sericulture

○ Two promising outlines of silkworm U5 and U8 with better larval and cocoon characters and filament length were identified through mass selection method.

○ Kanva-2, MR-2 and Palladam Local type of mulberry were well suited for management practices and high leaf yield at NPK level 250:100: 100 kg/ha. In field experiments MR-2 was observed to be the best one in which the cocoon weight and filament lengths were more. MR-2 and Kanva-2 were superior in protein content.

Forestry

○ Mutant progenies in Eucalyptus were developed through irradiation. Extensive perambulation of the existing plantations of Eucalyptus in the state has resulted in the identification of six seed stands of desirable germplasm for use as base stock. In the progeny yield trials 12 selections were better yielding consistently. Single noded cuttings for Eucalyptus seedlings offered scope for vegetative propagation.

Fisheries

○ Experiments on fish culture with different species combination and stocking densities suggested that murrels could be used as a component in composite fish culture to eliminate the weed fishes and keep the water clean. The composite fish culture of six species of Indian and exotic carps yielded 5482 kg/ha/year.

Rural Development Studies

○ High yielding crop varieties and new technologies generated 40-47 per cent additional employment.

○ Mixed cropping and mixed farming helped to minimise risk in farming and maximising income.

○ Studies on the marketing of brinjal and turmeric revealed that the producers shared 37 per cent and 69.18 per cent respectively in consumer's rupee.

○ In institutional marketing the percentage of notified crops marketed through the regulated market varied from 42.22 to 77.78 per cent.

○ Study of cotton farmers revealed that both big and small farmers were aware of hybrid varieties. Among big farmers, 24 per cent were fully aware of all the recommended practices while among small farmers 53 per cent were partially aware of all the recommended practices.

Seminars

○ During the year, 19 National and State level Seminars on various aspects of crop and animal production and rural development were conducted.

Library

○ The University provided adequate library facilities to research staff During the year 1979-80, 4300 books were added to the university library increasing the total number to 1.10 lakh books besides 1032 journals.

Finance

○ The teaching, research and extension education activities of the University are fully supported by funds from the Tamil Nadu State Government, Indian Council of Agricultural Research and other institutions such as Ford Foundation, SIDA, the World Bank, input firms and others. At present 49 ICAR Coordinated Projects, 30 ICAR Adhoc Schemes, 64 University Schemes, four Schemes financed by Foreign Agencies, three by Government of India and five by Private Agencies are in operation. Broadly classified, for the year 1980-81, for the total budget of Rs. 833.67 lakhs, the State Government has provided Rs. 645 lakhs which accounted for 77.36 per cent whereas the ICAR has given Rs. 166.26 lakhs (19.94 per cent) and Government of India and other agencies of Rs. 22.41 laks. For the activities during the Sixth Five Year Plan, it is proposed to have an outlay of Rs. 6265 lakhs of which Rs. 2057 lakhs will be for supporting new activities during the period.

RICE

CONTENTS

Crop Improvement 15

Germplasm conservation and evaluation 17
Disease resistance 17
Tungro 18
Bacterial blight 18
Sheath rot 18
Blast 18
Brown spot 18
Insect resistance
Brown Planthopper 18
Leaf folder 20
Breeding for fine grain 20
Salt tolerance 21
Tolerance to low intensity of light 23
Hybrid rice 24
Hybrid development through anther culture 24
Increasing cropping intensity 25
Low Cost Technology 28
Rices for various growth duration 28
Below 100 days 29
100 - 120 days 29
120 - 140 days 30
140 - 160 days 31
Above 160 days 32

Crop Management 33

Plant density 33
Nitrogen management 33
Nitrogen use efficiency 33
Carbofuran for higher yields 35
Micronutrients 35
Percolation loss in rice fields 35

Soil Management 36

Neem cake blended urea 36
Triacontanol on rice growth 37
Depletion pattern of K in rice soils 37
Effect of N & K 38
Effect of NPK 39
Rice bran oil 39

Biological Nitrogen Fixation 40

Blue green algae 40
Azolla 41
Multiplication 42
Nitrogen fixing capacity 42
Screening germplasm for nitrogenase activity 43

Crop Physiology 43

Salt tolerance 44
Drought tolerance 44
Cold tolerance 44
Protein content 44

Crop Protection 46

Management of diseases 46
Brown spot 46
Bacterial blight 47
Sheath rot 48
Tungro virus 48
Menagement of pests 48
Brown Planthopper 48
Stem borer 49
Management of nematodes 50

RICE

○ Crop Improvement

Tamil Nadu can surely boast of having boosted rice production markedly over the past few decades. In 1980, an all time record of 2185 kg/ha (State average) had been achieved with a total production of 62.3 lakh tonnes. This is in no small measure due to the breeding of new improved rice varieties which have replaced the traditional ones. These new rices, besides having high yield potential, possessed lodging resistance, erect leaves, semi-tall stature, nitrogen responsiveness and tolerance to some pests and diseases.

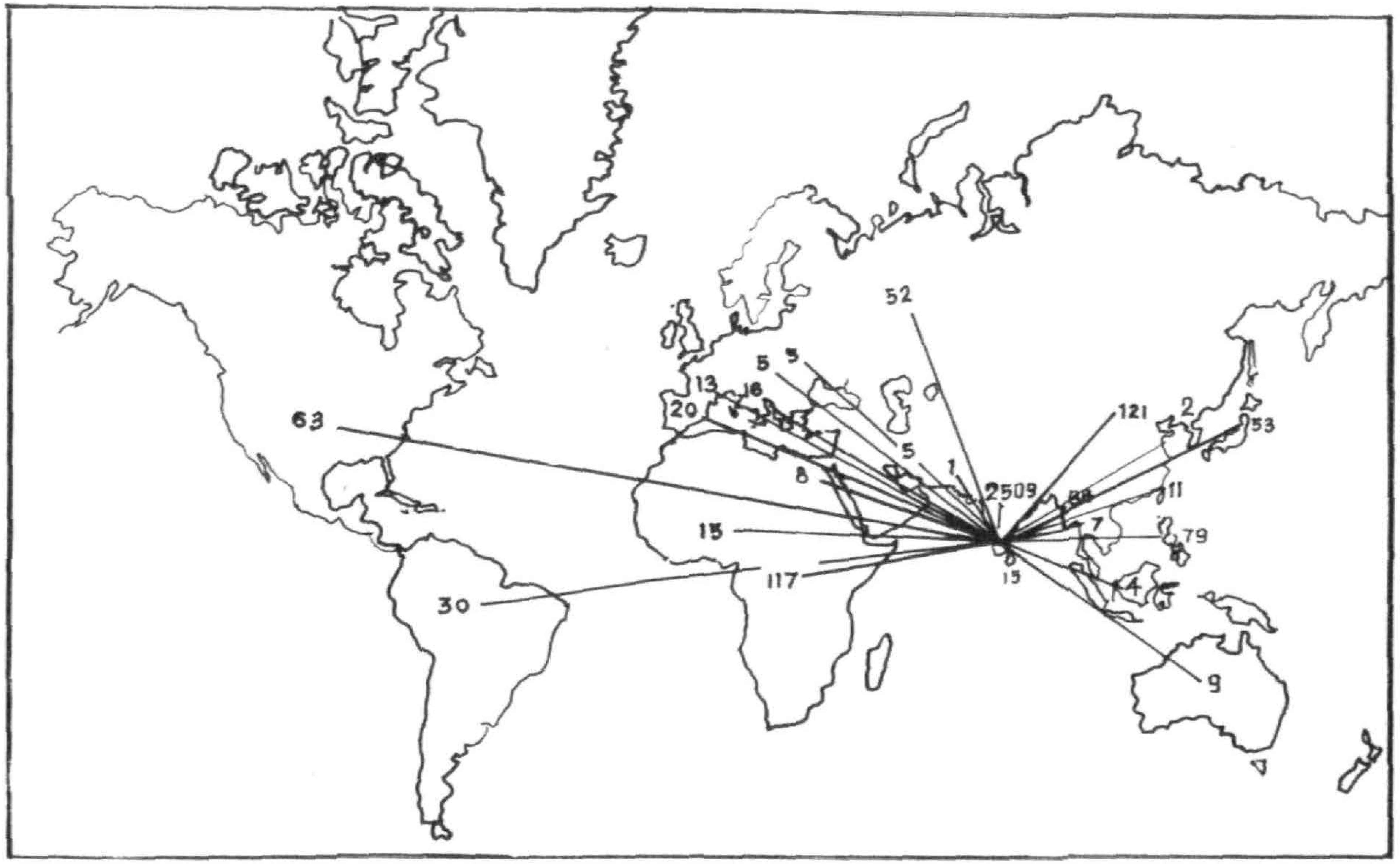
The Rice Breeders of the University continue the task of evolving newer varieties to still raise the present plateau of high yield in all growth duration groups suitable for different seasons and agro-climatic zones of Tamil Nadu. Rice Breeding programmes are undertaken in different research centres of the University at Coimbatore, Aduthurai, Madurai, Paiyur, Tiruchirapalli and Kattupakkam, besides Pondicherry. During 1980, top priority was given to achieve a break through in the yield potential of varieties to overcome specific constraints and for certain problem areas such as:

* Stress prone conditions of salinity/alkalinity
* Varieties with short growth duration for increasing cropping intensity
* Resistance to brown planthopper which has become a serious menace
* Resistance to Rice Tungro Virus whicn is causing concern to rice farmers
* Low intensity of light during Monsoon Seasons of *Samba, Thaladi* and *Pishanam*
* Responsiveness to low cost production technology without reduction in normal yields
* Development of viable rice hybrids utilising genetic male sterile lines to achieve spectacular increase in rice yields
* Germplasm conservation and evaluation for spotting out potential donors for hybridization.

Fig.1

GERMPLASM FROM RICE GROWING COUNTRIES

INDIA	2509
BURMA	88
JAPAN	53
ITALY	16
CEYLON	15
Br. GUINEA	15
IRAQ	5
EGYPT, UAR	6
AFRICA	117
PHILIPPINES	79
N. AMERICA	63
S. AMERICA	30
PORTUGAL	13
BULGARIA	5
RUSSIA	52
CHINA	121
AUSTRALIA	9
TAIWAN	11
S. KOREA	2
FRANCE	20
INDONESIA / JAWA	14
HOLLAND	5
PAKISTAN	1
THAILAND	7
OTHERS	25
Total	3281



Germplasm Conservation and Evaluation: Indigenous rice varieties grown by farmers the world over may carry genes for specific traits needed by rice breeding programmes like resistance to pests, diseases, stress conditions etc., in addition to quality and other economic characters. Since the initiation of systematic rice breeding in 1912, collection of varieties from different sources all over India and other rice growing countries of the world, has been made. During 1980, 225 varieties obtained from Himachal Pradesh were added on and at present 3281 varieties from 34 rice growing countries of the word are maintained at the Paddy Breeding Station, Coimbatore. The wealth of geneticv ariability available in this gene bank was utilised for choosing potential donors for hybridization, which have contributed to the evolution of many improved varieties. (Figure1).

In 1980, 2954 varieties from germplasm were evaluated for diseases and pest resistance under ephiphytotic conditions and 46 potential donors for transfer of resistant genes were identified.

Disease Resistance : Although occurrence of Rice Tungro Virus (RTV) in Tamil Nadu was first observed in Pudukottai in July 1970, the disease was noted on a field scale only in 1978 during Samba Season in Thanjavur delta. During 1979, the disease appeared in a severe form though not very widely spread in Thanjavur and Tiruchi Districts. Consequently work on RTV was intensified at Aduthurai and Coimbatore.

Other diseases of significance were Bacterial blight (*Xanthomonas Oryzae*), Sheath rot (*Acrocylindrium Oryzae*), Rice blast (*Pyricularia Oryzae*) and Brown spot (*Helminthosporium Oryzae*).

Resistance to Rice Tungro Virus: As a result of intensive screening by inoculation of germplasm by employing viruliferous green jassid vectors under green house conditions, the following eight varieties were found to be resistant at Coimbatore.

Gam Pai	Habigang,
Pankhari 203,	Khataribhog,
Ambemohar,	Latisail,
PTB 18,	IR 36,
IR 50	

At Aduthurai, 23 breeding lines were assessed for their resistance under severe incidence of tungro in the field under effective epiphytotic

conditions provided by bordering the test lines with five rows of T (N) 1, the susceptible variety.

Among these, three varieties IET 6262, IET 7226 and IET 7227 recorded very low incidence with 1.58%, 8.60% and 7.40% respectively while the rest had over 85% infection and the susceptible check T (N) 1 was completely wiped out. The variety IET 6262, a derivative of Pankaj x Vijaya, not only possessed very good field tolerance to RTV but also high yield potential of 5 - 6 tonnes per hectare. (Plate1)

Resistance to Bacterial blight: Two distinct resistant groups were identified for Bacterial leaf blight. Three varieties TKM.6, BJ 1 and Sigadis were found to possess overall resistance at growth stages for the pathotype 1 prevalent in Tamil Nadu. The juvenile plant resistance was noticed in ASD 5, MTU 16 and T 1069. The variety with overall resistance to pathotype 1 was TNAU 7124 (ASD 5 x IR 22) which also had high yield potential of 5 - 6 tonnes.

Resistance to sheath rot: Under high disease pressure 975 breeding lines and varieties were screened and no resistant entries were found.

Resistance to Rice Blast: Among the 525 entries field screened for resitance, two elite breeding lines TNAU 17005 and TNAU (AD) - 98 showed very high degree of field resistance when the disease was very severe on the susceptible variety Co 13.

Resistance to Brown spot: No resistant entry was found among the 1754 tested and only sixteen of those screened were moderately resistant.

Insect Resistance: Major emphasis was given to identify resistant donors for major insect pests like Brown Plant hopper (BPH) and leaf folder and generating fresh breeding lines utilizing these donors in hybridization programmes. Yield evaluation of elite cultures were also done.

Resistance to Brown Plant hopper: Intensive Green House Screening in 1980 resulted in the identification of further 35 resistant varieties (Table 1).

Plate 1

Plate 1. IET 6262 RICE CROP

Plate 2.

HIGH YIELDING FINE GRAINED RICE DPI 591

TABLE 1. Potential Donors for BPH Resistance (Green House screening grades 1-9)

Variety/Breeding line	Grade	Variety/Breeding line	Grade
Sinna Sivappu	1	IR 15324-117-2-2-3	3
Sulai	1	IR 19660-73-4-2-2	3
ARC 11354	1	IR 19661-23-3-2-2	3
IR 17494-32-2-4	1	BKNBR 1631-3-4-3	3
IR 17494-32-3-4	1	IET 6315	3
IR 17496-2-25-1	1	IET 6311	3
Suduru Samba	.1	IET 6860	3
ARC 14766	3	IR 9129-102-2	3
BKNBR 1088-83	3	IR 13240-83-1	3
IR 42	3	IR 19661-131-1-2-3	3
IR 13929-196-1	3	IR 19661-63-1-2-3	3
IR 15323-78-1-3-1	3	IR 19661-150-2 2-2	3
IR 13525-118-3-2-2	3	IR 19661-364-1-2-3	3
IR 17492-18-10-2-2-2	3	IR 19672-19-3	3
MRC 603-303	3	T 7	3
Vellailangayam	3	T 1477	3
IR 13540-56-3-2-1	3	Mudu Kiriyal	3
		Vazhaipoo samba	3

Fresh crosses numbering 17 sets were made involving resistant parents T7, ASD 11, Vazhaipoo samba to transfer resistant gene to the other popular varieties. Segregating progenies in F_3 generation were studied and 52 single plants were selected for further testing. Among the 40 elite BPH resistant breeding lines evaluated for yield, eight proved promising (Table 2).

TABLE 2. Yield performance of elite BPH resistant breeding lines

	Lines	Parents	Grain yield (t/ha)
1.	IET 5741	Imp. Sabarmathi/Sona	5.0
2.	IET 7002	Mashuri mutant	4.8
3.	IET 7006	Waikoku/CR 1014	4.6
4.	IET 6238	Vijaya/PTB 21	4.6
5.	IET 6890	RP 31-49-2/LMN	4.4
6.	IET 6329	MTU 15/Waikoku	4.4
7.	IET 5717	Vijaya / PTB 21	4.2
8.	IET 7330	CR 94-1512-6/P-2-21	4.1

Resistance to leaf folder : Through green house screening the following varieties were observed to be resistant.

GEB 24, PVR 1, ASD 5, Co 32, ARC 10550, ASD 11, T 7, IET 5741 BKNBR 1088-83, TNR 2.

To incorporate resistant genes in the other popular cultivated varieties 11 sets of crosses were made with the resistant parents BKNBR 1088-83 and ARC 10550.

Breeding for fine grain : *The need to develop rices with fine* grain quality coupled with high yield has of late become important for satisfying consumer acceptability and also for fetching higher price in the market. In 1980, elite breeding lines obtained from crosses involving fine-grained varieties of 1974 were tested for yield at Coimbatore. Three fine-grained lines gave higher yields than the popular fine grained variety IR 20 (Table 3).

TABLE 3. Comparative Performance of Four Fine Grained Rice Varieties

Breeding line/ Variety	Parents	Duration	Grain yield (kg/ha)
TNAU 3933	Bhavani/BCP 1	130	7233
TNAU 20994	Bhavani/BCP 1	110	7038
TNAU 80007	IR 2061-465-1-5-5/ IR 2053-521-1-1/IR 8071 -625-1	115	5795
IR 20	IR 262/TKM 6	135	5488

At Paiyur, a high yielding fine grained rice culture DPI 591, was isolated from a breeding line of cross between IR 1721-14/IR 1330-3-3-2 originally obtained from IRRI. This variety with a growth duration of 135-140 days was suitable for both *Samba* and *Navarai* seasons. The grain type of this variety is finer than GEB 24 and has wide consumer acceptability among the rice farmers of the command area of Krishnagiri Reservoir project. (Table 4). (Plate2). (Figure 2).

Fig. 2

PERCENT INCREASE IN YIELD OF DPI 591 RICE

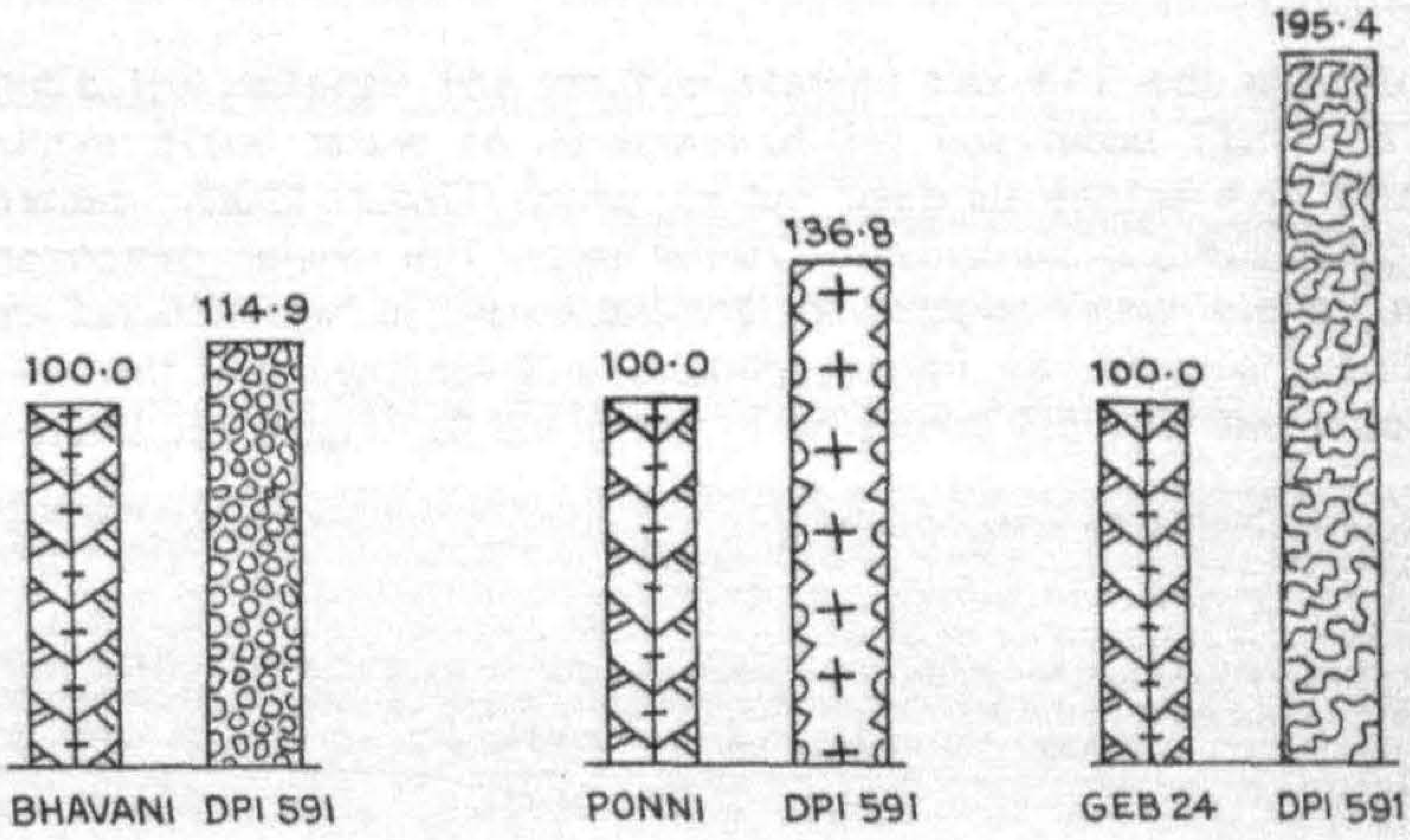


TABLE 4. Yield of DPI 591 at Paiyur

	Grian yield (kg/ha)						
	1978 Navari	1978 Kharif	1979 Kharif	Mean	% inc. over Bhavani	% inc. over Ponni	% inc. over GEB 24
DPI 591	8688	6908	7985	7860	14.9	36.8	95.4
Bhavani	6950	6367	7141	6819			
Ponni	—	5309	6204	5757			
GEB 24	4830	3300	3966	4032			

Salt tolerance: Breeding work for salt tolerence was initiated in 1944 and intensive screening of over 700 varieties pooled from different sources was continued over the years in search of donors for salt tolerance breeding programme. Consequently donors like Savadu samba, Thella Thoka Vadlu, Pokhali, SR 26 B, Dasal, Getu, Karuppu Nel and Savul Samba were identified. The first alkali tolerant rice variety

released for large scale cultivation was PVR 1 a derivative of MTU 1 and SR 26-B. After evaluating 850 segregating lines involving 98 cross combinations in different generations 78 breeding lines showed promise. Among them the most outstanding culture combining salt tolerance and yield was TNAU 17005 (Dasal x IR 20) of 140 days maturity.

Among the 113 salt tolerant cultures and varieties tested during 1980 at Trichi under soil pH 10.4 and EC of water 3.015 m.mhos/cm[3], only five entries survived out of which TNAU 17005 recorded the highest survival percentage (70 per cent). The yield performance of this variety was evaluated in Coimbatore and in salt affected areas in different centres like Paiyur, Madurai and Aduthurai and the highest yield obtained was 6.7 tonnes/ha (Table 5 and 6). (Figure 3). (Plate 3).

Fig. 3

YIELD PERFORMANCE OF TNAU 17005

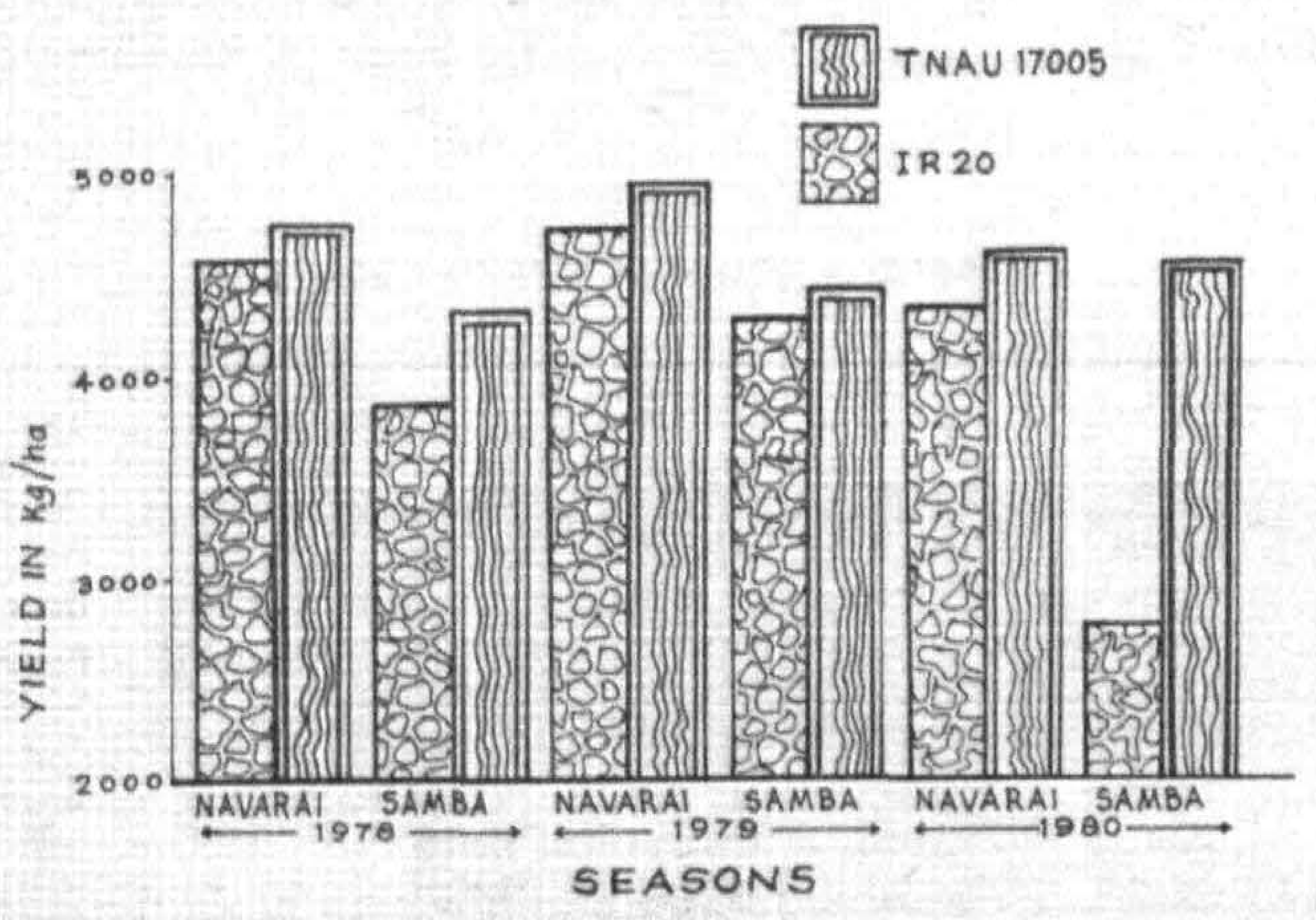


TABLE 5. Yield performance of TNAU 17005 at Coimbatore

	Grain yield (kg/ha)					
	1978		1979		1980	
	Navarai	Samba	Navarai	Samba	Navarai	Samba
TNAU 17005	4750	4317	4942	4415	4608	4582
IR 20	4576	3849	4715	4262	4347	2784

Plate 3

CULTURE TNAU 17005

COMBINING SALT TOLERANCE AND YIELD

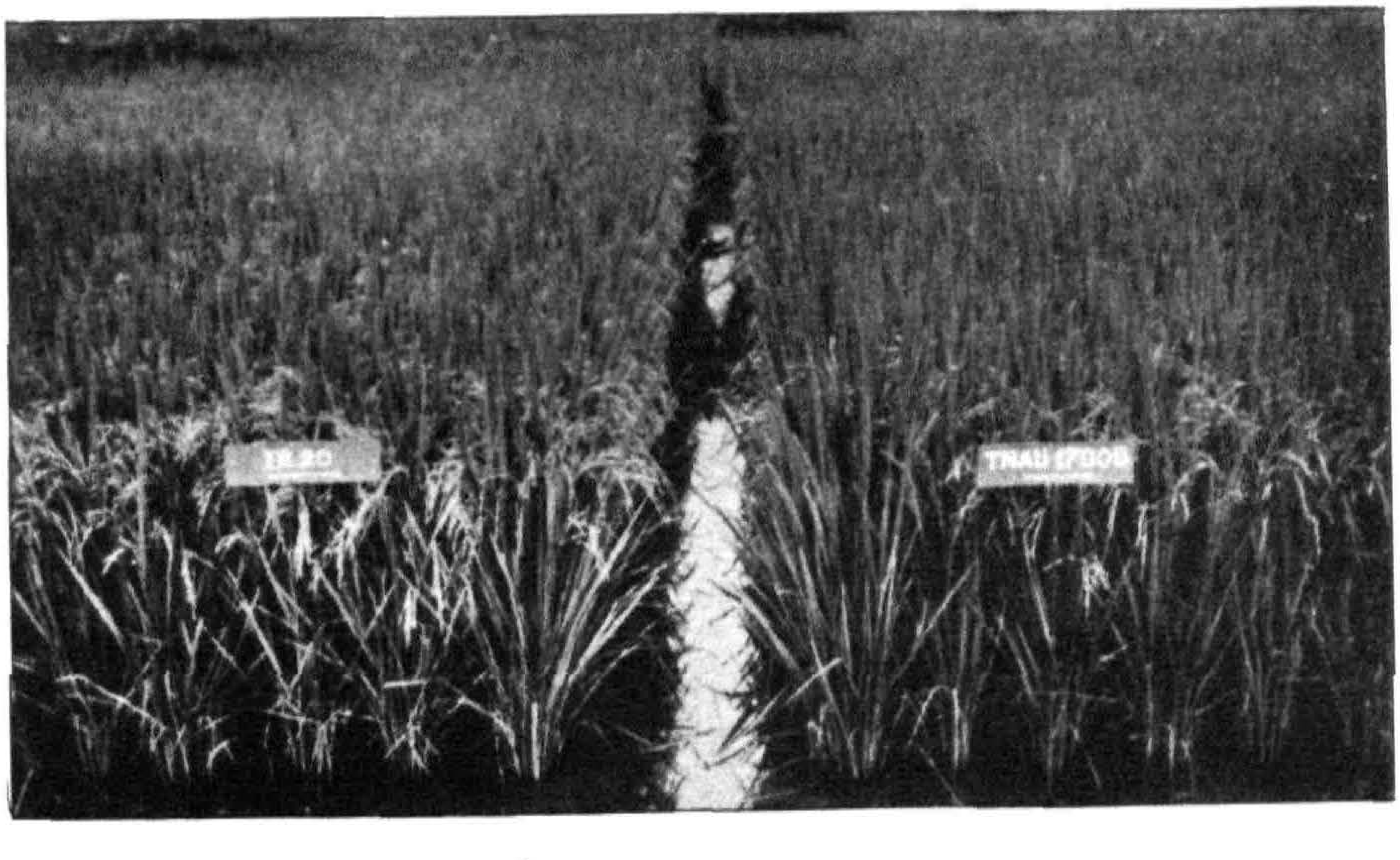


Plate-4 CULTURE TNAU 15776/3 TOLERANT TO LOW INTENSITY

TABLE. 6 Yield performance of TNAU 17005 in salt affected centres

	Grain yield (kg/ha)	
	TNAU 17005	Check variety
1. Paiyur (Two centres)		
Centre-A	6762	4619 (AU 1)
Centre-B	4416	3218 (Local)
2. Aduthurai	3972	2675 (IR 20)
3. Madurai	3351	3005 (IR 20)

At Paiyur, among the alkali tolerant breeding lines tested in alkali soil (9.1 pH), culture DPI 594 recorded the highest survival percentage showing appreciable tolerance (Table 7).

TABLE 7. Reaction of alkali tolerant rice varieties

Breeping line/ variety	Parents	Duration	Survival percentage
DPI 594	Selection from Nona Bokra (IRRI)	120	95
Savul samba	Paiyur local	135	91
Karuppunel	Paiyur local	125	89
DPI 599	Co 9/IR 22	143	82
DPI 781	Gettu/IR 8	140	72
DPI 598	Co 9/IR 22	128	72
Gettu	Variety from West Bengal	130	61

Tolerance to low intensity of light : The yields of rices grown late in the seasons of *Samba*, *Thaladi* and *Pishanam* of different regions of Tamil Nadu are below normal due to low intensity of light that prevails from October to January. Studies were initiated in 1977 at Coimbatore to identify breeding lines/varieties which could give higher yield even when sown after 15th October. IR 20 is normally preferred by farmers for growing late in the season. With a view to select lines/varieties which could give higher yield than IR 20, 142 rices belonging to different growth duration groups were field tested by growing very late in the season (sowing after 15th October). Tolerance to low intensity of light was exhibited by only varieties with 135 days growth duration and above. Among them the following four lines/varieties gave high yields as compared to IR 20. (Table8). (Plate 4).

TABLE 8. Breeding lines/varieties with tolerance to low light intensity and their yields

Breeding line variety	Parents	Growth duration	Grain yield (kg/ha) 1977-78	1978-79	1979-80	Av. yield
TNAU 17005	Dasal/IR. 20	135	6785	6750	6900	6812
TNAU 15776/3	ASD 5/IR 20	135	—	5800	6900	6350
IET 6238	Vijaya - PTB 21	135	—	7250	8875	8062
Co 42	RP 31-49 2/LM. Nahng	140	—	7763	7100	7432
IR 20	IR 262 / TKM 6	130	5357	4609	4530	4748

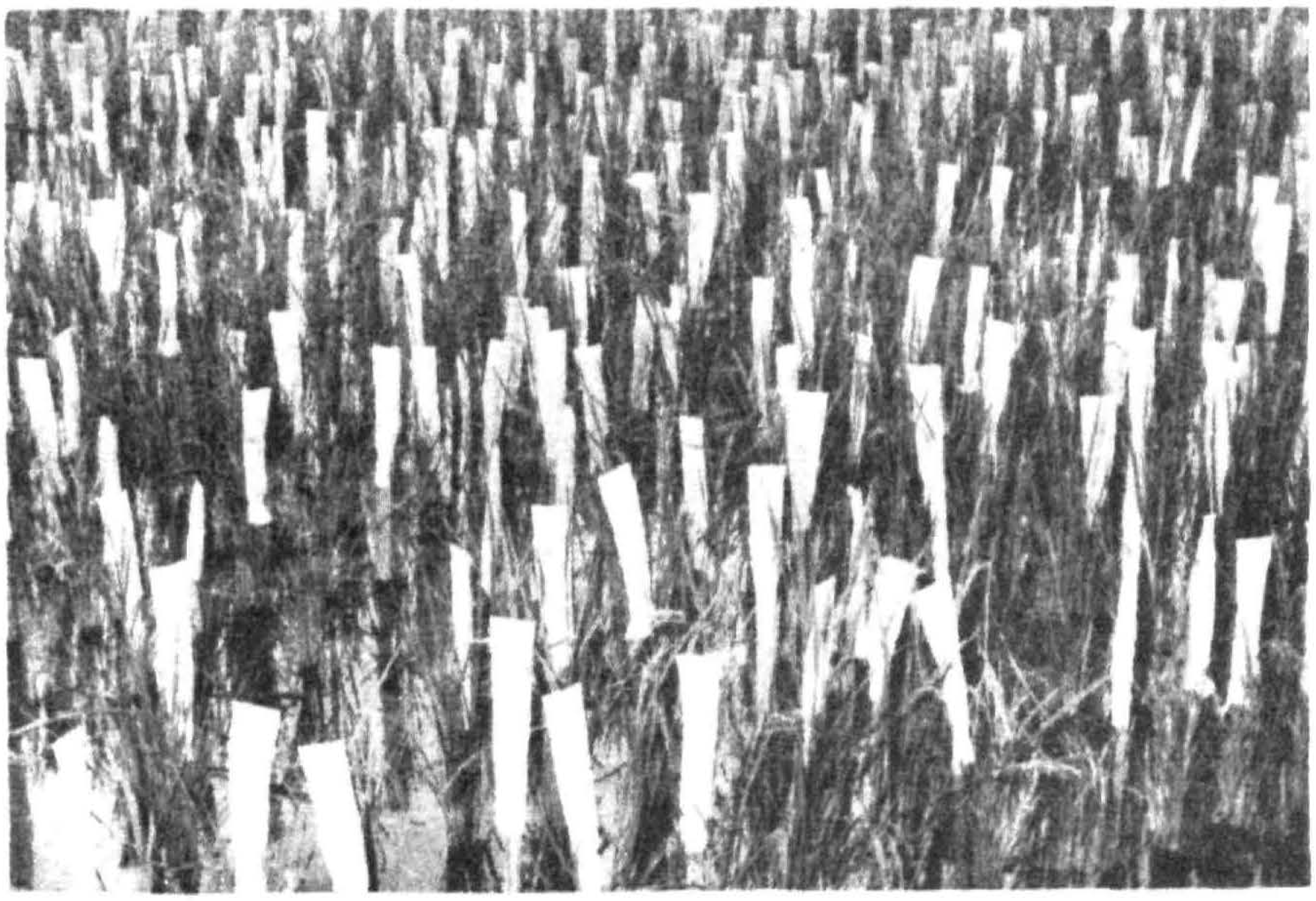
Hybrid Rice : Spectacular improvement in yields have been obtained in other crop plants by utilizing the expression of heterosis for production of commercial hybrids. With the identification of male sterile lines and restorer lines in rice in India and elsewhere the exploitation of hybrid vigour seems to be possible in rice. Intensive work was initiated during 1980 and a total of 663 rice collections from Assam and Himachal Pradesh were selfed to identify male sterile lines. In order to produce a viable hybrid with already available male sterile line V.20A by assessing the combining ability with other varieties, ten sets of crosses were made during 1980 (Plate 5).

Hybrid development through anther culture : Haploid plants have a single set of chromosomes in the sporophyte. Their significance for plant improvement as a tool in various disciplines of plant science has been stresssed. Since haploids are of great importance in production of homozygous plants, they are needed in large numbers. However, the conventional methods employed by plant breeders for their production are cumbersome, laborious and not very efficient. With the introduction of techniques for the induction of 'androgenesis' by the culture of excised anthers, it has become increasingly evident, that anther culture methods could considerably speed up the production of haploids for breeding programmes.

Anthers of the hybrid plants of rice were explanted and cultured in dark room on the potato extract medium containing 2, 4-D for callus development. The calluses were then transferred to differentiating medium in which 2, 4-D was eliminated. The inoculated anthers were induced to form haploid calluses but at a low frequency ranging 1 - 2%. Regeneration of plants from callus were successfully obtained in the F1 hybrids of ASD 8 x Co 37 and ASD 8 x Co 38 and also from F2 hybrids of ASD 8 x Co 39.

Plate 5

RICE IDENTIFICATION OF MALE STERILE PLANTS



Although the calli formation from hybrid anthers was low, 30-50% of calli regenerated plantlets. Albinos appeared over two-fold more (60 - 80%) than normal green plantlets (20-40%). About 15% of calli initially regenerated roots prior to initiation of shoots. None of the calli that regenerated roots prior to shoots would differentiate into plantlets. Calli that produced only roots died afterwards. On the contrary, those calli that initiated shoots would eventually develop into complete plants. In this case, roots appeared after shooting. (Plate6 & 7).

The current research is oriented towards the use of more selective culture procedures with anthers which favour the development of embryo rather than callus development and also suppress albino formation and preferentially favour the development of green embryos for maximal culture yields.

Inreasing Cropping Intensity : Varieties with short growth duration of 100 - 110 days are required for increasing cropping intensity in areas where 2 or 3 crops of rice are grown in sequence in the same land. Research to develop more high yielding pest resistant rices suitable for *Sornawari*, *Kar*, *Kuruvai* and *Navarai* seasons in different rice growing regions of Tamil Nadu and with even shorter growth duration than the existing varieties was continued. In 1980, 263 early generation progenies of crosses involving short growth duration varieties like ASD 8, Cul 340, Co 29, Co 39 and Co 41 were evaluated and 343 breeding lines were selected for further testing to isolate superior genotypes. The yields from the elite early breeding lines and the popular varieties ranged 5 - 6 tonnes in the advanced yield tests conducted at Coimbatore, Aduthurai, Bhavanisagar and Paiyur (Table 9). (Plate 8).

TABLE 9. Yields from promising lines and varieties that mature in 100 - 110 days

Breeding line/Variety	Parents	Growth duration (days)	Yield	
			t/ha	kg/day
COIMBATORE				
1. TNAU (AD)-98	Triveni/Co 39	107	6.2	58
2. TNAU (AD)-103	Triveni/Co 39	104	6.1	58
3. TKM 9	TKM 7/IR 8	107	5.9	55
4. IET 3283	IR8/DhunganSali	100	5.3	53
5. ADT 31	IR 8/Cul 340	105	4.8	46
6. TNAU 1756	Bhavani/T (N) 1	110	5.5	50

Plate 6

ANTHERE CULTURED RICE PLANT

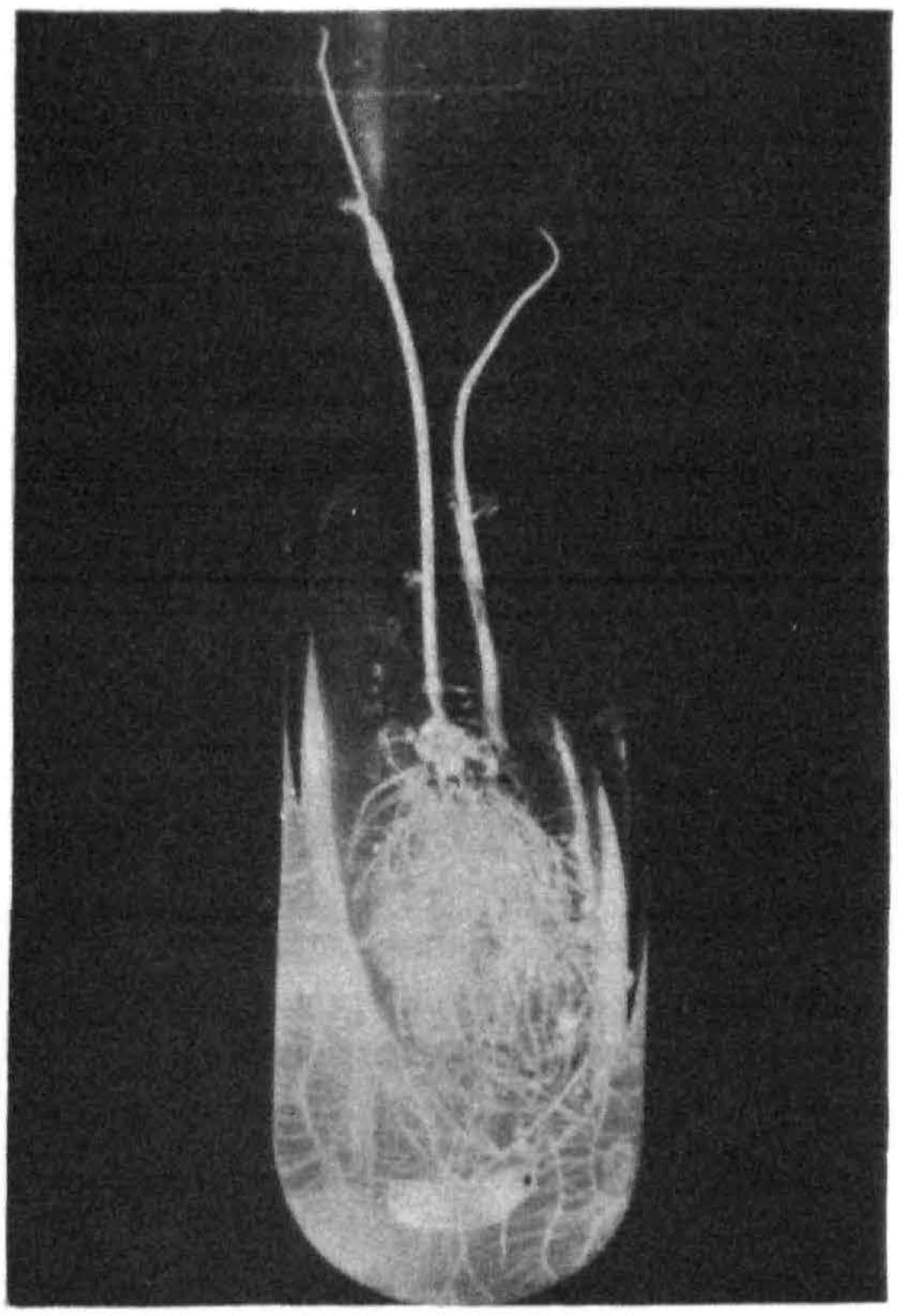
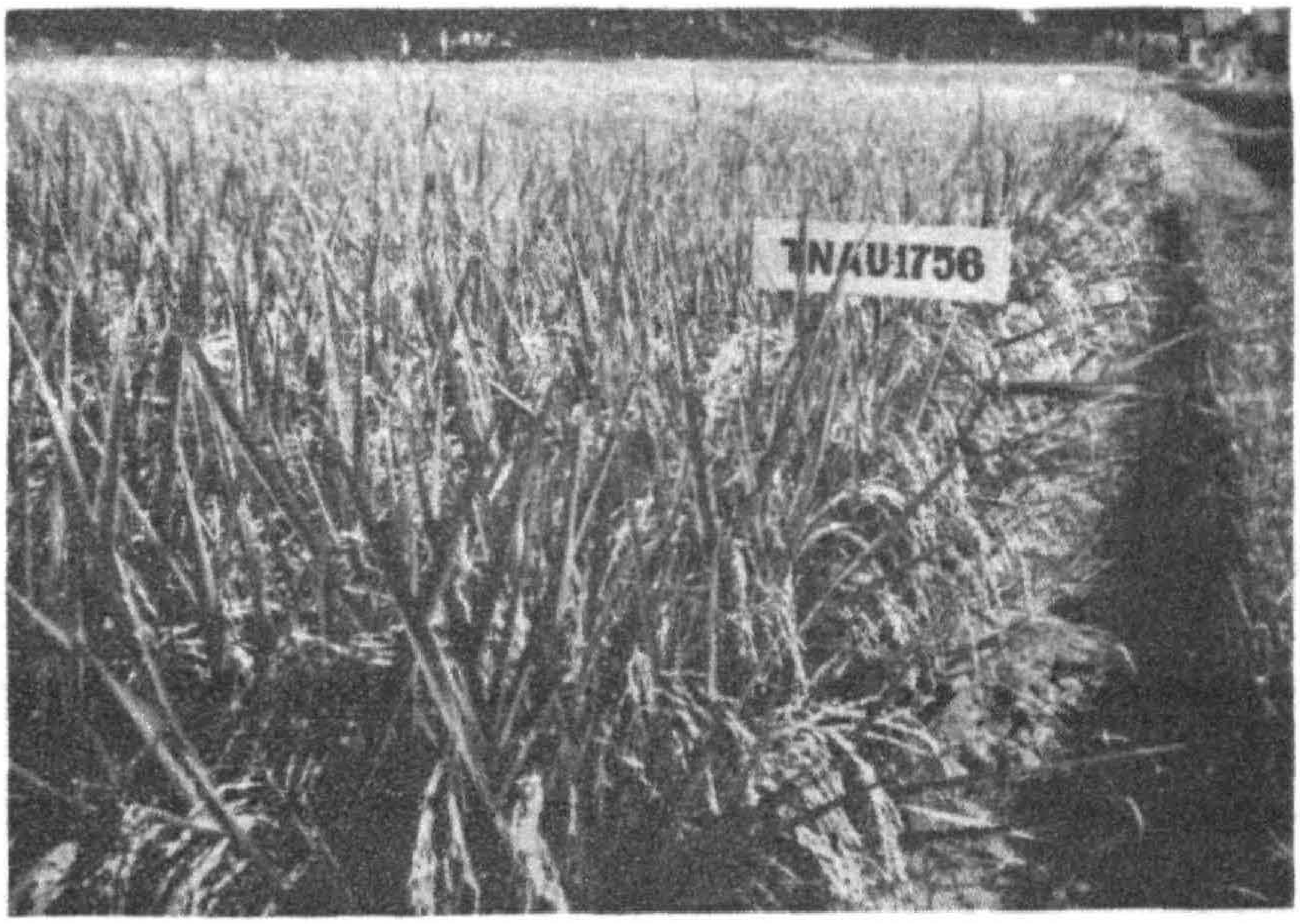


Plate-7 ANTHER CULTURE DEVELOPED

Plate - 8 CULTURE TNAU 1756 - A PROMISING LINE MATURING IN 110 DAYS



ADUTHURAI				
1. TNAU (AD)-98	Triveni/Co 39	105	5.0	48
2. TNAU (AD)-103	Triveni/Co 39	105	6.8	65
3. TNAU (AD)-104	Triveni/Co 39	105	6.6	63
4. TKM 9	TKM 7/IR 8	110	6.1	55
5. ADT 31	IR 8/Cul 340	105	5.9	54
6 IET 4786	CR 10-114/CR 115	105	5.8	55
BHAVANISAGAR				
1. TNAU (AD)-103	Triveni/Co 39	104	7.1	68
2. TNAU (AD)-104	Triveni/Co 39	106	7.4	70
3. Co 41	Cul 2410/IR22	107	4.8	45
4. ADT 31	IR 8/Cul 340	107	6.7	62
PAIYUR				
1. TNAU (AD)-98	Triveni/Co 39	107	6288	56
2. TNAU (AD)-103	Triveni/Co 39	105	5328	51
3. TNAU (AD)-104	Triveni/Co 39	105	5404	52
4. Co 39	Cul 340/Kannagi	107	4747	44
5. Co 41	Cul 2410/IR 22	105	4798	47

Response to low cost production technology: In order to assess the yield capacity of rice varieties at low level of manuring medium duration varieties were tested under different levels of NPK. The variety white Ponni and TNAU 17005 yielded over four tonnes/ha at a low level of 20 N, 10 P and 10 K (kg/ha) while other varieties like IR 20, IR 34, Co 42 gave still lower yields. In view of the increasing cost of inputs, this aspect of research will be further intensified to identify Breeding lines/varieties capable of giving higher yields at lower fertilizer levels.

Genetic Improvement of Rices for various Growth Duration Groups: The eight distinct seasons of rice cultivation in Tamil Nadu, namely *Navarai* (January to April-May), *Sornavari* (April-May to August-September), *Kar* (May-June to Sept-Oct), *Kuruvai*, (June July to Oct-Nov), Early *Samba* (June-July to Nov-Dec), *Samba* (July-Aug to Dec-Jan), *Thaladi* or *Pishanam* (Sept-Oct to Feb-Mar) and Late *Samba* (Oct-Nov to March-April) need newer varieties possessing yield potential higher than the varieties now grown by farmers. With this background, breeding work was continued in 1980, in all the five growth duration groups of rice.

Below 100 days : Very early (below 100 days duration) rice varieties are needed for cultivation during *Kuruvai*, *Kar*, *Sornavari* and *Navarai* seasons particularly during conditions of limited water availability. A total of 262 early generation progenies of crosses involving ASD 8, Co 41, IET 1444, Co 39 and IR 28 were evaluated for their yield potential. Besides, 124 breeding lines/varieties having growth duration of below 100 days were assessed for their yield in advanced trials. Ten lines among these gave higher yields (Table 10).

TABLE 10. Yield of promising lines with duration less than 100 days.

Breeding line	Parents	Duration in days	Yield kg/ha	Per day yield (kg)
TNAU 6464	Bala/Co 13	100	5019	50.2
TNAU 20027/1	TN 1/Cul 340	99	4948	49.9
TNAU 8925/12	Cul 340/IR 20	98	4500	45.9
TNAU 9475/4	Kannaki/Co 21	97	4426	45.6
TNAU 20060/2	ASD 8/55337	99	4378	44.2
TNAU 6914	Bala/Cul 340	99	4296	43.4
TNAU 13936	Bala/Co 13	96	3907	40.7
TNAU 9426/6	Kannaki/Cul 2032	94	3659	38.9
TNAU 9426/7	Kannaki/Cul 2032	94	3298	35.1
TNAU 18016	Bala/Cul 2032	96	3209	33.4
Co 39	Cul 340/Kannaki	95	3585	37.7

From 100 to 120 days : Rices of this growth duration group are grown not only during the seasons of *Kar*, *Sornavari* and *Navarai* but also in early *Samba* season.

At Coimbatore, 226 F_1 plants belonging to twelve sets of corosses involving parents such as Bhavani, Vaigai, Co 40, IR 36, ASD15. IR 40, Co 38, IR 20, DPI 335, DPI 863, Co 29, PTB 30 and ASD 11 were studied and 91 of them were selected for further study. A total number of 677 breeding lines/varieties were also evaluated in advanced trials and 8 lines yielded above 5 tonnes (Table 11).

TABLE 11. Breeding lines with yield more than five t/ha

Breeding line/ variety	Parents	Duration in days	Yield (kg/ha)
IET. 2361	IR. 8/N. 22	117	6667
IET. 6238	Vijaya/PTB. 21	117	6484
TNAU. 7892	Manila/IR. 22	116	6094
TNAU. 18620	IR. 20/BC. 11-6-3	115	5792
IET. 3630	Manila/IR. 22	116	5706
TNAU. 8999/4	Bala/Co. 13	111	5667
IET. 3305	IR. 8-24-6/H. 10	110	5443
Vaigai	TN-1/Co. 29	120	4313

At Paiyur, among the 31 elite breeding lines evaluated for their yield, eight were outstanding (Table 12).

TABLE 12. Yield performance of eight outstanding breeding lines at Paiyur

Breeding line/variety	Parents	Duration in days	Yield (kg/ha)
TNAU 8999/4	Bala/Co 13	115	6390
DPI 831	Bhavani/Pusa 33	118	5897
IET 2851	TKM 6/TN 1	120	5855
IET 2361	IR 8/N 22	114	5855
DPI 863	Cul 2410/CR-12-178	120	5855
Vaigai	TN 1/Co 29	120	5759
DPI 165	Kannagi/Bhavani	119	5718
DPI 215	IR 20/Kannaki	116	5655

From 120 to 140 days : This is the group which comprises rice varieties wth the highest yield potential. These are grown during early *Samba*, and *Navarai* seasons.

294 breeding lines of different generations (F_1 to F_6) were evaluated for selection of superior genotypes. Apart from this, 310 advanced breeding lines/varieties were tested for their yield performance in

various yield trials. Fourteen lines were identified as best yielders among them. (Table 13).

TABLE 13. Breeding lines/varieties which yielded above six tonnes/ha among rices of growth duration between 120 and 140 days

Breeding lines/variety	Parents	Duration in days	Yield (kg/ha)
Puduvai Ponni (PY-1)	Ponni/IR 8	135	8[illegible]78
IET 6441	RPW6-13/Supriya	130	8400
20H-27-97	IR 8 mutant	132	7987
IET 6686	IR 2042/CR.64-13	134	7935
IET 7046	IR 8/IR 20	128	7807
IET 5709	GEB 24/Sigadis/IR 8	121	7577
TNAU 20216	Co 2/IR 8	134	7692
TNAU (BSR) 12	Bhavani/IET - 1444	133	7654
IET 6263	Pankaj/Vijaya	135	7495
TNAU 17005	Dasal/IR 20	135	7384
TNAU 15776	ASD 5/IR 20	135	7215
Bhavani	Peta/BPI 76	135	7224
IET 2815	IR 8/TKM 6	120	6555

At Paiyur, 35 breeding lines were assessed for their yield and five were found to record more than six tonnes. (Table 14).

TABLE 14. Yield particulars of 5 breeding lines

Breeding line/variety	Parent	Duration in days	Yield (kg/ha)
DPI 648	Co 2/Manila	128	7302
DPI 591	IR 721-14/IR 13303-3-2	140	7287
DPI 655	Bhavani/IR 20	132	6746
DPI 662	Jaya/Co 18	136	6607
Ponni	Taichung 65/ME 80/ME 80	140	6310

From 140 to 160 days: During *Samba*, *Thaladi* and *Pishanam* season, varieties of this duration are preferred.

A total number of 461 single plants belonging to 26 sets crosses were studied and 291 plants were selected for further evaluation.

From F_2 to F_6 generations, 392 progenies were studied for selection of promising lines. Among the 176 breeding lines/varieties tested for yield the following were the promising ones. (Table 15).

TABLE 15. Promising breeding lines of 140-160 days growth duration

Breeding line/variety	Parents	Duration in days	Yield (kg/ha)
TNAU 15875	ASD 5/T (N) 1	144	7451
TNAU 15868	ASD 5/T (N) 1	145	7223
TNAU 17609/5/2	Ponni/Co 36	140	7164
TNAU 4036	IR. 5/Co 19	141	7083
IET 5898	Pankaj/Jagannath	160	6956
TNAU 4136	Ponni/Vijaya	145	6277
TNAU 4691	Ponni / Vijaya	136	5722
TNAU 4139	Ponni / Vijaya	147	5636
Co 38	IR 8/Co 25	145	5380

Above 160 days : This group of rices are grown mainly in single crop areas during *Samba* as well as in the second crop seasons of *Thaladi* and *Pishanam*.

Seeds from 318 F_1 hybrids of 14 sets of crosses involving parents such as Co 38, IET 5656, IR 20, IR 36, IR 40, IR 42, Co 40, Co 42 and BAM 3 were collected. 577 progenies belonging to F_2 and F_3 generations were also evaluated for selection of promising lines, Among the 170 breeding lines/varieties compared with Co 25 and Co 40, three lines were outstanding. (Table 16).

TABLE 16. Yield performance of three outstanding breeding lines

Breeding line/variety	Parents	Duration in days	Yield (kg/ha)
IET 5882	CR 63-5218/Pankaj	161	6120
IET 6212	RP-31-49-2/Patnai 23	160	5957
A 5046	BG 90-2 Peta/Ponni	162	6629
Co 25	Co 4/ADT 10	165	3444
Co 40	IR 8/Co 25	160	5111

Crop Management

Plant density : A seed rate of 100 kg/ha was found to be optimum for the rainfed variety MDU 1 under Madurai conditions. (Table 17).

TABLE 17. Yields of rainfed rice at different seed rates

Seed rate (kg/ha	Grain yield (kg/ha)
60	1185
80	1556
100	1834
120	1014
140	1120

Nitrogen Management : Super granules of urea applied at 54 kg N/ha showed higher efficiency of nitrogen management by recording the highest yield of 4381 kg/ha (Table 18).

TABLE 18. Effeiciency of urea nitrogen in transplanted rice

Form of urea	Grain yield (kg/ha)
Control	2557
27 kg N as Urea split	3295
27 kg N as sulphur coated urea	3662
27 kg N as Super granules of urea	3706
54 kg N as Urea split	3882
54 kg N as Urea broadcast	3430
54 kg N as Sulphur coated urea	3874
54 kg N as Super granules of urea	4381
108 kg N as Urea split	3931
108 kg N as Urea broadcast	3827
108 kg N as Sulphur coated urea	4169
108 kg N as Super granules of urea	4298

Nitrogen use efficiency : Among the means of increasing the efficiency of nitrogen, the granulated compost containing 5 per cent

Fig. 4

FFICIENCY OF NITROGEN IN THE FORM OF GRANULATED COMPOST

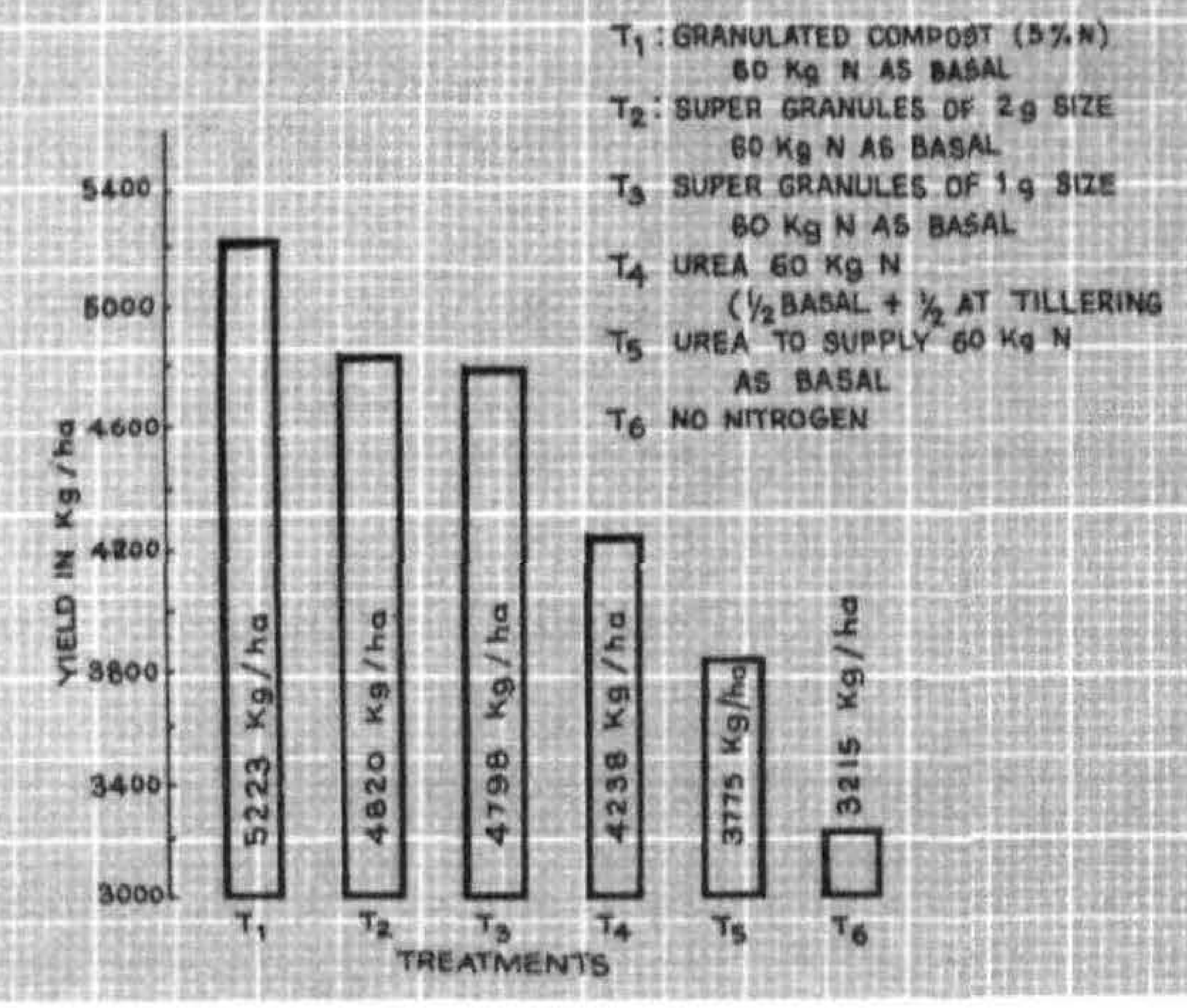
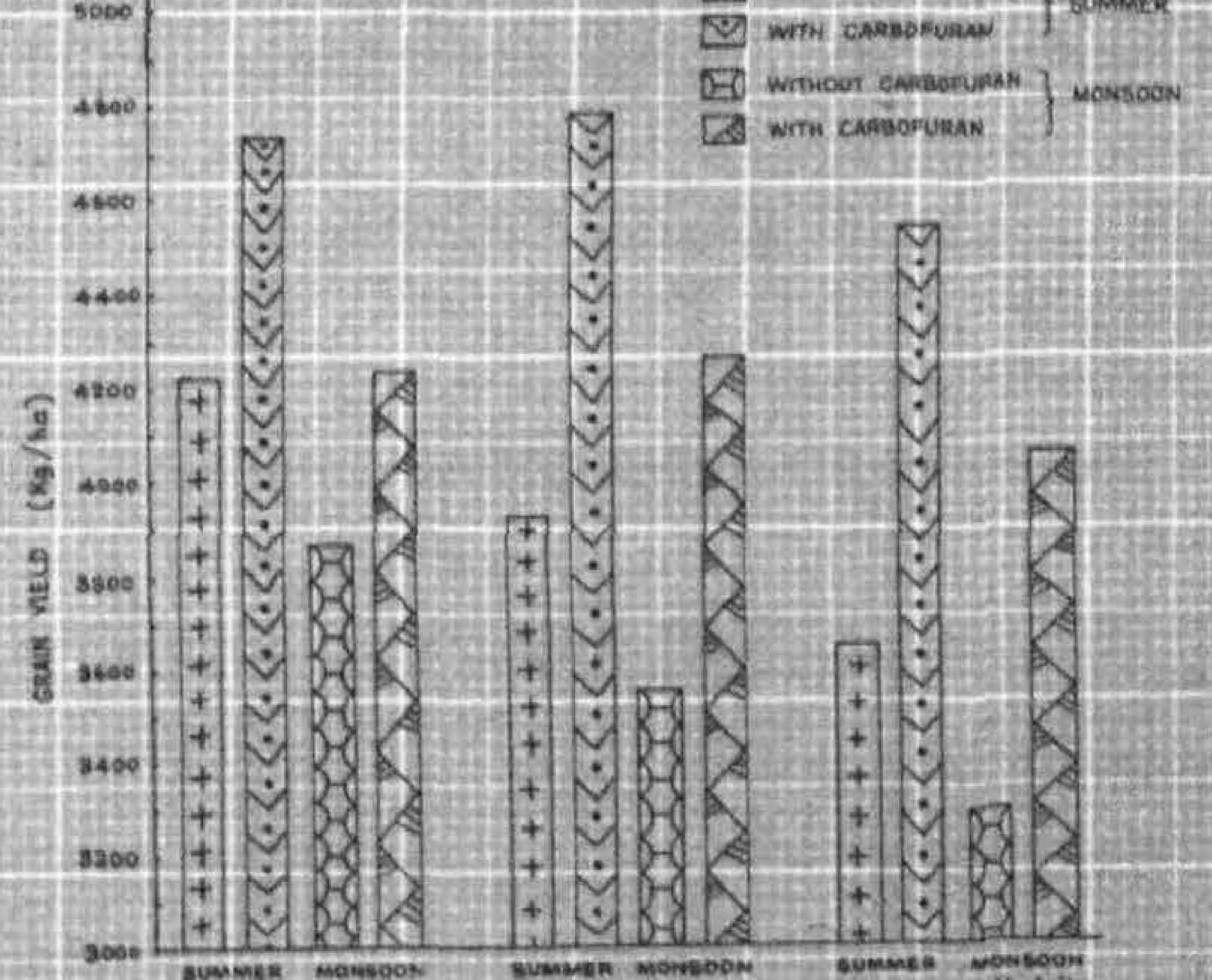


Fig. 5

EFFECT OF CARBOFURAN ON GRAIN YIELD OF RICE



of nitrogen applied to supply 60 kg N/ha was found to give the highest mean yield of 5223 kg/ha as compared with the other forms of nitrogen (Figure 4).

Effect of Carbofuran on the yield of low land rice: Carbofuran application at the rate of 0.5 kg a.i./ha on 20 and 45 days after planting recorded higher yields both in summer and in monsoon seasons as compared with no application (Figure 5).

Effect of micro-nutrients on yield : Ferrous sulphate (12.5 kg/ha) and zinc sulphate (25 kg/ha) applied as basal and zinc sulphate (25 kg/ha) applied on 21st day of transplating over and above FYM (12.5 tonnes/ha) with 100 kg N, 50 kg P_2O_5 recorded the maximum yield of 6775 kg/ha (Table 19).

TABLE 19. Effects of Zinc and Iron on rice yield

Treatments	Grain yield (kg/ha)
1. FYM (12.5 tonnes) + (50 N + 50 P + 50 K) kg/ha	4298
2. FYM (12.5 tonnes) + (100 N + 50 P + 50 K) kg/ha	4638
3. FYM (12.5 tonnes) + (100 N + 50 P + 50 K) kg/ha + Micronutrients	6775
4. FYM (12.5 tonnes) alone	3583

Preparatory tillage and percolation loss in rice fields : In an experiment to find out the effect of depth of ploughing and number of ploughing and reduction in percolation loss in rice fields, country plough and mould board plough were used to plough to depths of 4" and 6", 2 and 3 times and the rice variety Vaigai was transplanted. Percolation loss was measured by the drum culture technique. The percolation loss varied from 12.5 cm to 15.0 cm for different treatments, but their difference were not significant. Total consumptive use of water by the crop was 63.0 cm and the yield varied from 3480 kg to 3765 kg/ha. Since there was no difference in pecolation loss between the treatments, it is sufficient if two number of ploughings either by country plough or mould board plough are given for preparatory tillage for rice cultivation (Table 20).

TABLE 20. Percolation loss and yield of rice in different preparatory tillage.

Treatment	Percolation loss in cm	Grain yield kg/ha
6" ploughing - 3 No.	14.3	3480
4" ploughing - 3 No.	14.7	3625
4" ploughing - 2 No.	13.6	3495
6" ploughing - 2 No.	12.5	3765

Soil Management

Efficiency of Neem cake blended urea : The efficiency of utilisation of applied N is very low amounting only to about 30 per cent and the remaining applied N is lost by leaching, volatilization, denitrification, run off, etc. In recent times the use of slow release fertilizers and nitrification inhibitors has been found to increase the N use efficiency. As the synthetic products are expensive, the use of locally available indigenous products such as neem cake could serve as a suitable substitute as nitrification inhibitor. Field trials conducted in this regard showed that about 25 per cent of the nitrogenous fertilizers could be saved on account of usage of neem cake blended urea instead of urea as straight fertilizer. Table 21.

TABLE 21. Influence of Neem cake blended urea application on yield and nutrient uptake

Treatment	Mean yield (kg/ha) Grain	Nutrient uptake (kg/ha) Grain		
		N	P	K
60 kg N/ha as urea	2870	32.7	7.9	27.5
90 kg N/ha as urea	3433	39.4	10.1	24.2
120 kg N/ha as urea	3796	46.2	12.5	21.6
60 kg N/ha as urea+neem cake	3481	38.5	9.2	26.9
90 kg N/ha as urea+neem cake	4081	49.1	12.6	23.8
120 kg N/ha as urea+neem cake	4574	54.9	14.4	20.4

Effect of triacontanol-a plant growth hormone on rice: Newer plant growth hormones are synthesised or extracted from plants to study their effect on plant growth. Triacontanol, a polyhydric alcohol synthesised from the extracts of lucerne hay, has been reported to give encouraging results on the performance of rice, tomato, cucumber, beet root, maize etc. A pot experiment was conducted to test the effectiveness of triacontanol as foliar spray at 0.1 mg/lit on the yield and quality of IR 20 rice superimposed over recommended dosage of NPK. The results of the experiment revealved that the triacontanol spray increased the grain yield of rice by 24.5 per cent and that of staw by 31.7 per centas compared with that of the NPK treatment alone. The uptake values of NPK were also favourably influenced due to triacontanol spray (Table 22).

TABLE 22 Effect of Triacontanol spray on yield, protein content and nutrient uptake in IR 20

	Mean yield (g/plot) grain	Mean protein in Per cent	Nutrient uptake (mg/pot) Grain		
			N	P	K
Control	14.2	9.0	138.8	11.3	98.3
$N:P_2:K$ @ 120:60:60 kg/ha	21.7	9.4	215.1	26.1	156.4
Lucerne hay @ 400 kg/ha+NPK @ 180:54:56 kg/ha	24.6	9.8	245.6	22.1	157.2
Lucerne hay @ 800 kg/ha+NPK @ 96:47:52 kg/ha	19.8	9.6	187.7	13.8	122.5
Lucerne hay @ 1200 kg/ha+NPK @ 84:41:48 kg/ha	19.1	9.2	177.6	15.3	114.6
Lucerne hay @ 1600 kg/ha+NPK @ 72:34:44 kg/ha	16.9	9.1	162.5	13.5	115.1
NPK plus triacontanol spray @ 0.01 mg/lit.	22.3	9.5	216.6	23.6	160.8
NPK plus triacontanol spray @ 0.01 mg/lit.	27.3	9.9	261.4	27.2	201.5
NPK plus triacontanol spray @ 1 mg/lit.	24.3	9.5	232.2	21.8	169.8

Depletion pattern of K in rice soil: The need for potash fertilisation is still a debated topic. The results of some of the earlier experi-

ments showed absence of response to the application of K. This was perhaps due to the high K supplying power of soils. A study was contemplated to investigate the K depletion pattern of different forms of K in soil under intensive relay and exhaustive cropping programme. The information on the K supplying power and the rate of depletion of K is needed in order to have judicious application of K for economic returns.

A continuous intensive pot experiment was conducted using Coimbatore wetland soil with IR 20 rice as test crop. The treatments consisted of five levels of K (0, 50, 100, '50 and 200 kg/ha) and four levels of N (0, 100, 200 and 300 kg/ha) replicated thrice. Six crops of IR 20 rice were raised using the same soil.

There was depletion of both exchangeable and water soluble K in the soil at post-harvest stage in the control with progressive increase in the number of harvests made due to the crop removel (Table 23).

TABLE 23. Depletion pattern of water soluble and exchangeable Potassium in soil grown with IR 20 Rice kg/ha.

Form of K No. of crops/ Treatment	Exchangeable potassium kg/ha		Water soluble potassium kg/ha	
	Firs crop	Sixth croup	First crop	Sixth crop
N_0	725.60	820.90	59.43	54.00
N_{100}	684.69	785.30	56.29	54.75
N_{200}	674.24	768.50	67.97	57.13
N_{300}	640.64	722.10	68.39	58.54
K_0	618.80	554.05	57.30	38.16
K_{50}	640.30	691.84	59.76	50.08
K_{100}	690.66	776.33	60.29	57.88
K_{150}	713.06	899.25	66.82	63.61
K_{200}	743.90	949.52	70.93	70.82

Effect of N&K on rice field : With every increase in the application of N. there was Corresponding increase in the yield of rice grain and straw for all the six crops taken so far. But in the case of K application, response of rice was noticed, only from the third or fourth crop indicating that the K reserve of the wetland wsoil couid supply K for 3 crops of rice (Table 24).

TABLE 24. The effect of N and K on the yield of IR 20

No. of crops/ treatment	Mean grain yield (g/pot)					
	I	II	III	IV	V	VI
N_0	14.87	10.30	7.38	10.34	17.33	12.34
N_{100}	25.23	16.90	11.14	19.47	21.01	21.73
N_{200}	30.71	21.94	12.94	29.06	26.51	30.79
N_{300}	36.79	23.37	17.45	37.28	35.86	40.32
K_0	28.48	18.33	11.79	24.77	25.14	25.76
K_{50}	28.16	19.31	13.20	26.23	21.04	28.51
K_{100}	25.59	17.77	10.82	21.73	26.00	25.70
K_{150}	24.84	17.89	9.15	21.96	24.90	26.51
K_{200}	27.44	17.34	16.18	25.50	28.11	23.99

Effect of NPK on rice : The results of a field investigation carried out in the wetlands of Coimbatore indicated that there was increase in the yield of grain and straw of rice with every increase in the levels of N tried up to 180 kg N/ha It was further observed that the effect of P and K was not pronounced on the yield of rice grain. However, application of P and K considerably increased the yield of rice straw. (Table 25).

TABLE 25. Influence of individual nutrients on yield of grain and straw of IR 20 Rice

	Grain(kg/ha)	Straw (kg/ha)
N_0	2972	9,976
N_{60}	4540	11,888
N_{120}	4831	14,236
N_{180}	5429	17,758
P_0	4517	12,959
P_{30}	4654	13,620
P_{60}	4474	13,815
K_0	4617	12,508
K_{30}	4198	13,761
K_{60}	4832	14,123

Rice bran oil : Rice bran oil has been observed to be a good source of edible oil. Information on the oil yield of different varieties of rice, the most efficient method of extraction and the quality of oil are lacking. Studies carried out with 55 varieties of rice bran on these lines revealed that the bran oil content varied from 2.4 per cent (TNAU 6464) to 21.7 per cent (CO 32). The oil yield was the highest from IR 20 (72.3 kg/ha) and the lowest from Basumati (7.1 kg/ha). Based on

the oil content and oil yield the varieties were classifield as, low, medium and high yielders of bran oil (Table 26).

TABLE 26. Grouping of varieties of rice for their bran oil yield.

Low	Medium	High
IET 2222, PVR 1, CO 39, IR 5, TNAU 4614, CO 38, ADT 30, IR 28, IR 30, GEB 24, Sugadas, Basumathi, ASD 5.	ASD 14, Cul 6464, TKM 6, Cul 833, ADT 27, Bhavani, TNAU 4609, TNAU 4611, Kannaki, Sathya, ADT 31, IR 22, Rathna, Suriya, Suhasini, RP 4-14	Vaigai, CO 34, CO 35 CO 29, Cul. 658, IR 8 CO 33, CO 36, IR 20

Parboiling increased the oil content and slightly decreased the free fatty acid (FFA) development in the oil. The studies on the storage of bran oil revealed that rhe FFA content in the oil of the parboiled bran samples was considerably less even on the 60th day after extraction of bran oil compared to bran oil from raw rice, Infra red irradiation treatment of the bran oil for 2 to 4 hours and storage reduced the FFA content considerably (12.3 per cent) compared to the unirradiated rice bran oil (20 to 49.5 per cent on the 30th day).

Biologicnal Nitrogen Fixatlon: Research on increasing biological fixation of nitrogen through Azolla and Blue green alage in the rice root zone was continued in the centre of advanced study in Microbiology.

Effect of blue-green algae on rice : From a field trial condcted at Paddy Breeding Station, Coimbatore to know the effect of blue-green algal inoculation along with graded levels of fertilizer nitrogen of rice variety, IET 3280, the results indicated that the blue-green algal inoculation along with 50 per cent of the recommended dose of fertilizer nitrogen gave the grain yield of 6047 kg/ha recording an increase of 18.8 per cent over the corresponding uninoculated control which gave an yield of 5072 kg/ha. Similary, blue-green algal inoculation with 75 per cent and 100 per cent recommended doses of fertilizer nitrogen gave respectively the grain yield of 6869 kg/ha and 6776 kg/he recording 8.7 per cent and 5.4 per cent increases over the corresponding controls which gave 6319 kg/ha and 6429 kg/ha. With the increase in the level of fertilizer nitrogen, response of rice crop to blue-green algalization is reduced although maximum yield was recorded with

algal inoculation along with 75 per cent fertilizer nitrogen. Therefore, the application of blue-green alage could result in the saving of fertilizer nitrogen to the extent of 25 per cent (Table 27).

TABLE 27. Effect of blue-green algae on the grain yield of rice (IET 3280) Manurial level : N.P:K=100:50:50 kg/ha.

Treatment	Grain yield (kg/ha) Uninoculated control	BGA inoculated	Per cent increase over control
50% N	5092	6047	18.8
75% N	6319	6869	8.7
100% N	6429	6776	5.4

Effect of Azolla on Rice : The results of a field trial conducted to know the effect of application of *Azolla* by two different methods along with different levels of fertilizer nitrogen, on the grain yield of rice variety, IET 3280, indicated that both the method of *Azolla* application increased the grain yield of rice. However, the application of *Azolla* as green manure crop gave higher yield ranging from 5411 kg/ha to 5784 kg/ha than the application of *Azolla* as a dual crop which recorded yield ranging from 4673 kg/ha to 5705 kg/ha. At every level of fertilizer nitrogen, the use of *Azolla* gave higher yield than the uninoculated control. The application of *Azolla* as green manure along with 50 per cent fertilizer nitrogen recorded 5411 kg/ha while uninoculated control with 50 per cent and 100 per cent fertilizer nitrogen gave the yield of 4550, 4967 and 4906 kg/ha respectively, indicating a saving of fertilizer nitrogen to the extent of 25 to 50 per cent without sacrificing the yield (Table 28). (Fig 6).

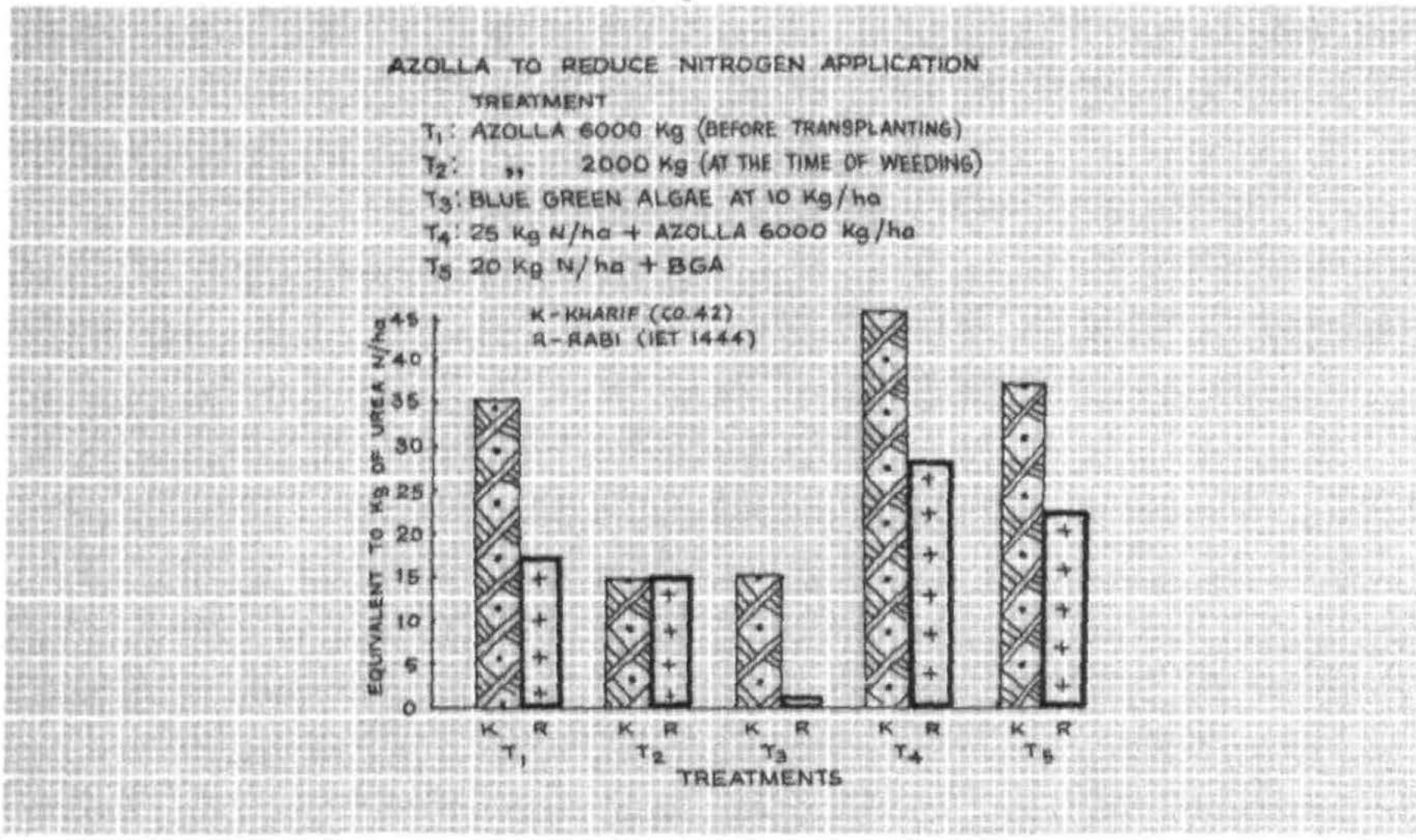
TABLE 28. *Effect of Azolla with different levels of fertilizer nitrogen on the grain yield of rice (IET 3280)*

Manurial level : N:P:K=100:50:50 kg/ha

Treatment	Grain yield (kg/ha) Uninoculated	Inoculated* Azolla (G)	Azolla (D)
50% N	4550	5411	4673
75% N	4967	5235	4901
100% N	4700	5784	5705

* Azolla (G) : Fresh Azolla fronds (1 kg/m^2) incorporated at the time of planting
Azolla (D) : Fresh Azolla fronds (100 g/m^2) allowed after planting and incorporated at the time of first weeding.

Fig. 6



Multiplication of Azolla : To know the effect of various amendments as the multiplication of *Azolla* experiments were conducted. Superphosphate, muriate of potash and cowdung slurry each at 1 per cent level were added either alone or in various combinations to the cement cisterns (1 mx 0.5 m) containing 50 g of *Azolla* as initial inoculum. Multiplication rate and nitrogenase activity of *Azolla* were estimated. The results indicated that addition of cowdung increased the *Azolla* biomass compared to superphosphate and potash. The multiplication rate was maximum (1.71 times) when cowdung was mixed with superphosphate. Application of cowdung increased markedly the nitrogenase activity in *Azolla* by recording 311.95 n moles of C_2H_4 produced/hr/gram of fresh weight of *Azolla* (Table 29).

TABLE 29. Effect of cowdung, superphosphate and muriate of potash on the growth and nitrogenase activity of Azolla

Treatment	Mean biomass (g/tank)	Rate of multiplication	Nitrogenase activity (n moles of C_2H_4/hr/g of fresh *Azolla*
Cowdung (1%)	68.0	1.36	31.95
Superphosphate (2.5 g/m²)	59.0	1.18	60 14
Muriate of potash (1.25 g/m²)	56.0	1.12	57.97
Superphosphate+Muriate of potash	71.0	1.42	74.68
Cowdung+Superphosphate	85.5	1.71	126.95
Cowdng+Muriate of potash	72.0	1.44	50.40
Cowdung+Superphosphate+ Muriate of potash	81.0	1.62	44.38

Nitrogen fixing capacity of Azolla : The results from the trial conducted with *Azolla* and blue green algae during *Kharif* and *Rabi* seasons on rice indicated the potentiality of azolla as a partial substitute for nitrogen fertilizer as it was estimated to supply 3.5 kg of N during *Kharif* and 17.4 kg of N/ha during Rabi when 6 tonnes of *azolla* per hectare was applied.

TABLE 30. Azolla as a partial substitute for nitrogen.

Treatment	Effect equivalent to kg of Urea N/ha	
	Co 42 (*Kharif 79*)	IET-1444 (*Rabi 1980*)
Azolla 6 t/ha (incorporated before transplanting)	35.1	17.4
Azolla 2 t/ha (allowed and incorporated) at the time of first weeding)	15.1	15.2
Biue green algae at 10 kg/ha	15.4	1.1
25 kg N/ha + Azolla 6 t/ha	44.8	28.0
25 kg N/ha + Blue green algae	37.5	22.2

Screening of germplasm collections of rice for nitrogenase activity : To study the variation in the prevalence and activity of non-symbiotic nitrogen fixers in the root zones of different genotypes of rice, screening of 579 genotypes of rice was carried out for the nitrogenase activity in rhizosphere soil. Positive nitrogenase activity was recorded in 571 genotypes, indicating all excepting 8 genotypes, harboured heterotrophic nitrogen fixing microorganisms. Of these, 47 genotypes were under the range of 21-30n moles of C_2H_4 produced/g/hr; 103 genotypes were between 11-20n moles of C_2H_4/g/hr; 292 genotypes were particularly of low activity and ranged from 1-10 n moles of C_2H_4/g/hr.

Promising 13 genotypes which recorded maximum nitrogenase activity were tested for their ability to stimulate the nitrogenase activity in the rhizosphere soil at different stages of crop growth and the results showed that maximum nitrogenase activity was recorded on 60th day after sowing.

Crop Physiology

Screening for stress in rice culture has been carried out. Salt, drought and cold stresses were invoved.

The digestibility of rice varieties as determined by animal experiments was found to vary from 90 to 95%. (Plate. 10)

TABLE 32. Correlation coefficients for relationship among the aminoacid values of 20 rice varieties

	Arginine	Histi-dine	Isoleu-cine	Leu-cine	Phenyl-alanine	Serine	Thre-onine
Arginine							
Histidine	-0.743						
Isoleucine	-0.925	-					
	-0.776	-					
Leucine	-	-	0.935				
Phenylalanine	-0.808	-	0.692	0.768*			
Serine	-0.968	-0.630	0.872	0.879	0.674		
	-0.882						
Threonine	-	-	-	0.789	0.484*	0.653	
Tyrosine	-	-	0.810*	-	0.580*		0.889
							0.814*

* Semilog.

Crop Production

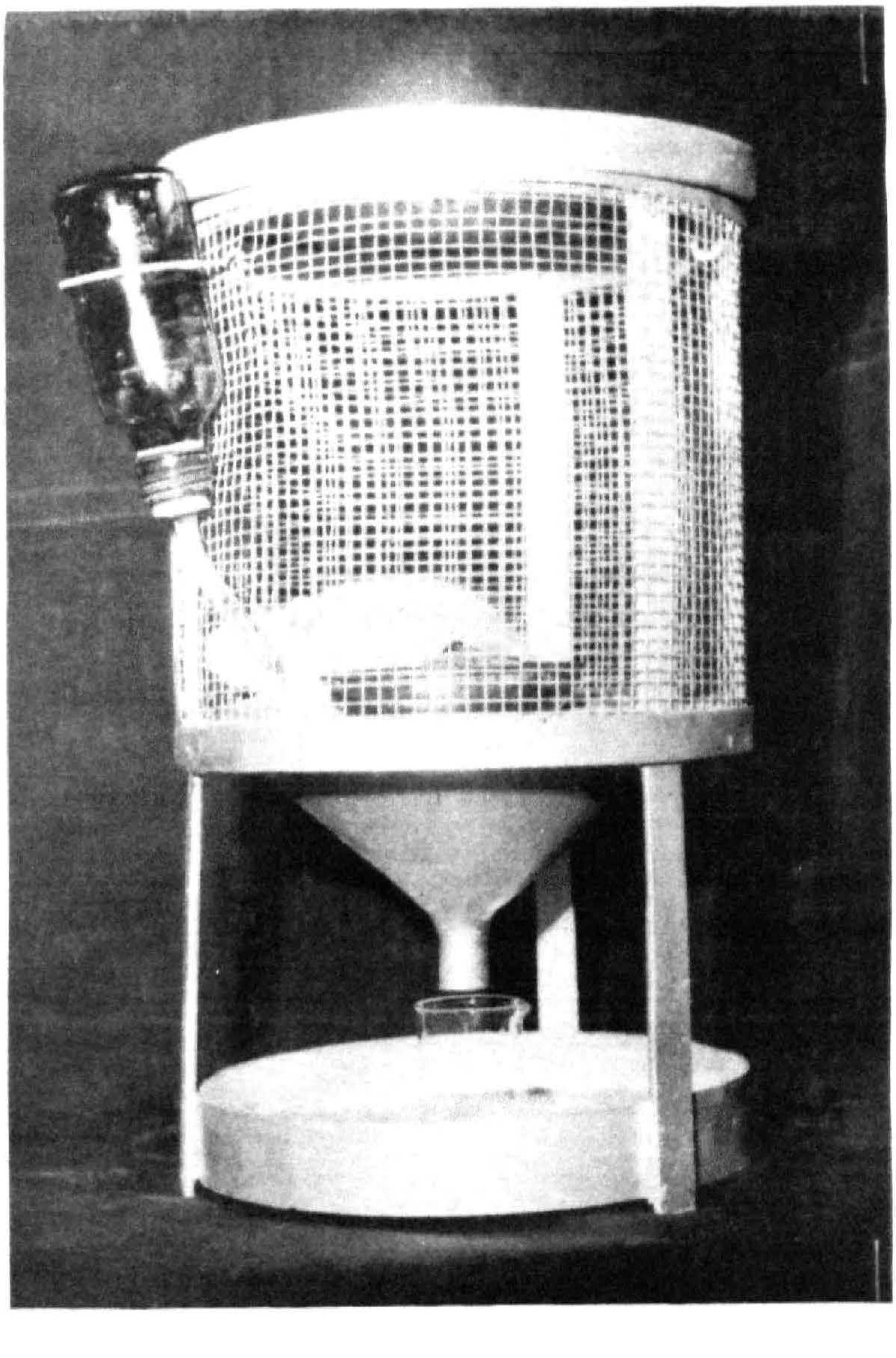
Control and management of diseases : The main thrust in the control of developing lines resistant to four important diseases of rice occurring in Tamil Nadu viz. Helminthosporiose, Sheath rot, Bacterial leaf blight and Tungro diseases are furnished in the previous chapters.

Management of the diseases by using chemicals have been tried to combat the disease spread.

Brownspot : Evaluation of four fungicides were made to ascertain their relative efficacy in controlling the brownspot disease of rice. The chemicals were sprayed as foliar spray immediately after noticing the apperance of the disease on leaves in the tillering stage of the crop and the disease severety was scored in the standard evaluation method of 0-9 scale. Fungicide Hinosan (0.1 per cent concentration) sprayed as and when necessary effectively controlled the brownspot disease (Figure 7).

Rice seeds soaked in Panoctine (0.2 per cent) dissolved in Dichloromethane (DM) for one hour killed seed borne pathogen effectively (Table 33).

Plate-10 METABOLIC CAGE TO STUDY DIGESTABILITY OF PROTEINS



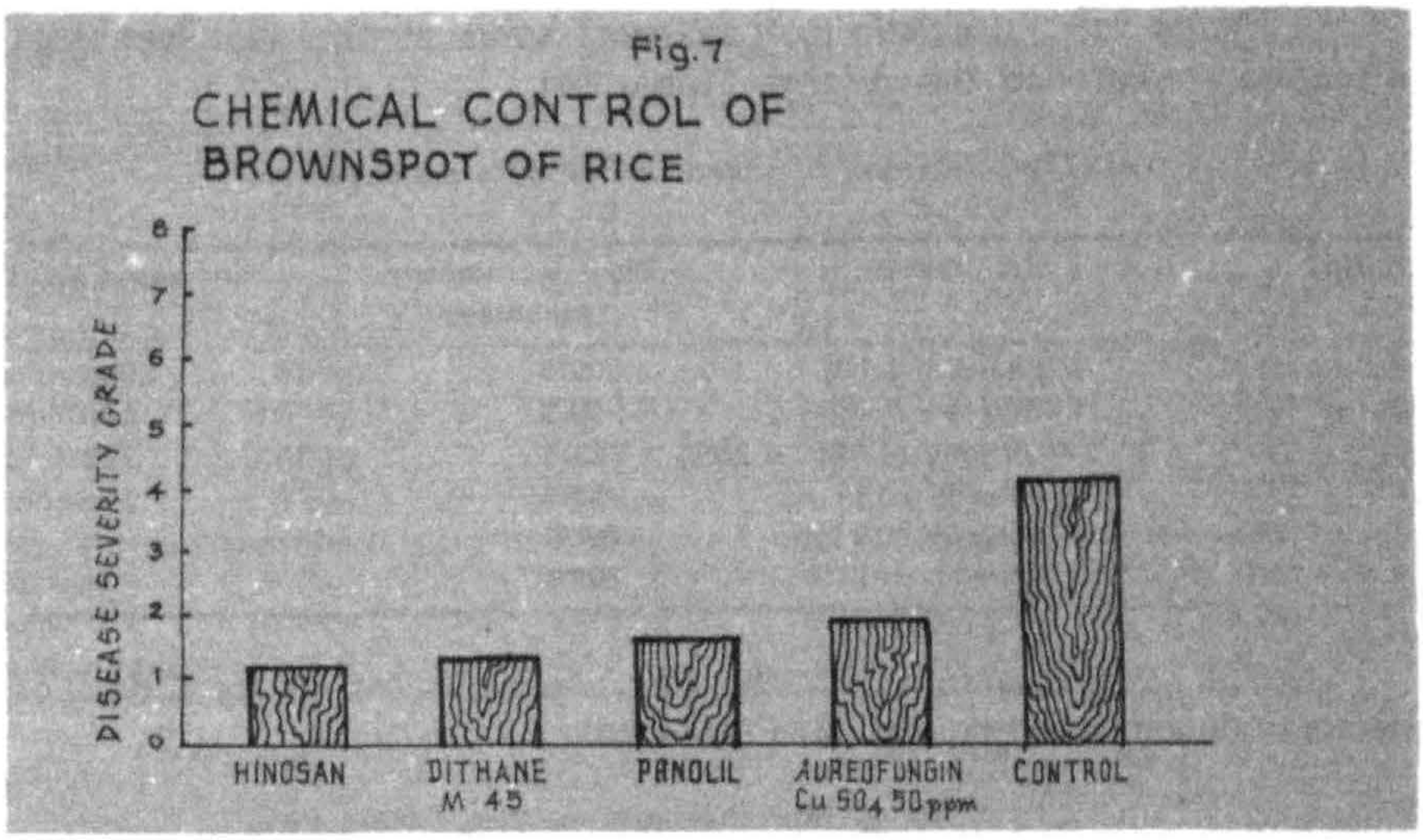


TABLE 33. Efficacy of fungicides in eradicating *H. oryzae* in rice seeds

Fungicide	Percentage of *H. oryzae* infection			
	Seed	Endosperm	Coleoptile	Root
Panoctine	0	52	0	24
Panolil	0	74	0	6
Dithane M. 45	0	72	10	29
Thiram	3	64	6	30
Agallol	0	60	12	30
Benlate T	10	62	16	28
Vitavax + Captan	0	56	0	10
Panoctine + DM	0	0	0	0
Panolil + DM	7	0	0	0
Benlate T + DM	20	28	0	0
Vitavax + Captan + DM	4	0	0	0
DM alone	5	0	0	0
Control	78	55	10	65

Bacterial leaf blight : Spraying bleaching powder (0.1 per cent) as a prophylactic spray at the active tillering stage and Bronidiol

(0.1 per cent) as a curative spray were found effective in the management of BLB disease.

Sheath rot : Bavistin (0.1 per cent) spray at the boot leaf stage effectively controlled the disease (Table 34).

TABLE 34. Control of sheath rot by different chemicals

S. No.	Treatments	Disease intensity percentage	Increased yield
1.	Bavistin 0.1%	6.6	534
2.	Hinosan 0.1%	9.9	480
3.	Dithane M. 45, 0.25%	12.1	366
4.	Panolil 0.1%	14.3	216
5.	Syllit 0.1%	27.5	90
6.	Control	50.6	—

Rice Tungro virus : All the four chemicals tested for control of vector reduced infection to half (Table 35).

TABLE 35. Effect of four chemicals on Rice Tungro Virus

Treatments	Disease infection grade
Carbofuran	24.75
Oftanol	26.40
Thimet	25.30
Cytrolane	28.60
Control	46.20

Control and management of insect pests :

Brown planthopper management : Efforts were continued during this year to field evaluate several insecticides for their effectiveness against the brown planthopper (BPH). In an experiment with IR 20 infested with BPH, 13 insecticides were evaluated by spraying at 15 days interval beginning from 30th day after planting. BPH population was recorded in 5 hills at random before and after spraying.

Among the insceticides tested, bendiocarb, isofenphos and MIPC were consistently effective in controlling the BPH (Table 36). The results are of practical significance in identifying newer chemicals in BPH control; endosulfan, monocrotophos and phosalone were second to them in effectiveness.

TABLE 36. Field evaluation of insecticides against Rice brown planthopper *Nilaparvata lugens*

Insecticide	ai./ha	Percentage reduction of BPH a week after First	Second spraying	Third	Mean
Endosulfan	350g	6.78	7.60	5.36	6.58
MIPC	500g	7.54	6.34	7.88	**7.26**
Vamidothion	300g	7.39	3.42	4.95	5.25
Chlorpyrifos	200g	6.83	3.59	2.22	4.21
Monocrotophos	200g	7.08	8.28	3.75	6.37
Phosphamidon	500g	7.09	4.68	5.03	5.60
Isofenphos	500g	7.21	**9.24**	**7.98**	**8.14**
Carbosulfan	480g	7.68	2.33	7.92	5.99
Phosalone	350g	7.88	5.84	5.10	6.27
Ethion	250g	**8.00**	0.71	7.20	5.30
Bendiocarb	500g	**8.98**	8.12	**8.14**	**8.41**
Neem oil	1000ml	5.48	0.71	6.74	4.30
Neem-seed kernel	25kg	7.09	0.71	7.59	5.12

*Transformed $\{\sqrt{X + 0.5}\}$ value

Stem borer management: The relative merits of effectiveness of three plant protection practices on the stem borer management were investigated. Studies with four rice varieties revealed that a need-based insecticide application is necessary to control stem borer infestation upto 30 days after planting (Table 31), However, between one foliar spray or granule application, there was no significant difference in stem borer infestation. This implied that plant protection at this crop growth stage could be economized by a foliar spray than application of insecticide granules.

TABLE 37. Stem borer infestation in rice varieties under different plant protection management

Management	Dead heart % (30 DAT) (T.V.) Variety: IET 2815	RPW 6-17	IET 6315	Jaya
No protection	14.93b	16.94b	19.24b	17.88b
	(6.6)	(8.5)	(10.9)	(9.4)
One foliar spray	11.03a	13.13a	12.50a	11.80a
(20 DAT)	(3·7)	(5.2)	(4.7)	(4.2)
One granule	12.24a	12.10a	13.33a	12.68a
application	(4.5)	(4.4)	(5.3)	(4.8)

Figures in parenthesis are actual percentage.
In a column, means followed by a common letter are not significantly different at 5 per cent level.

Management of nematode

The rice root nematode, *Hirschmanniella gracilis* was effectively checked by bare root dip of rice seedlings in mythmyl/phenamiphos/carbosulfan/aldoxycarle/phosphamidon 0.02 per cent for 20 minutes. Addition of 1 per cent urea has neither increased nor affected the nematicidal efficacy of these chemicals. Phosphamidon 0.02 per cent dip, costing Rs. 16/ha increased the yield by 33.5 per cent resulting in an additional income of Rs. 573/ha. (Table 38.)

TABLE 38. Bare root dip with phosphomidon for the control of Hirschmannielia gracilis on rice

Treatment	Nematode population/ 5g root	30 DAP Post-Treatment	Grain yield (kg/ha)	Per cent increase in yield over untreated	Cost of treatment Rs/ha	Addl. income Rs/ha
Phosphamidon 0.02% bare root dip for 20 minutes	1.2	44.0	2937	33.5	16	573
Untreated	4.0	125.0	2200	—	—	—

Significant at 5% level.

MILLETS

CONTENTS

Introduction 53

SORGHUM

Crop Improvement 54
- Germplasm 54
- Heterosis 54
- Hybrid derivatives 55
- Resistance to pests & diseases 56
- Resistance to drought 57

Crop Management 57

- Cropping systems 57
- Nursery techniques 58
- Combination of manures & fertilizers 59
- Biological nitrogen 60

Crop Protection 61

- Shootfly Management 61
- Screening for resistance 61
- Downy Mildew management 62
- Leaf blight and Rust management 62
- Head mould management 63

Seed Technology 63

- Seed hardening in rainfed sorghum 65

CUMBU

Crop Improvement 65
- Germplasm 65
- Heterosis 66
- Developing superior cumbu 66
- Resistance to pests & diseases 66

Crop Protection 66
- Downy Mildew management 66

RAGI

Crop Improvement 68

- Superior varieties 68
- Resistance to pests & diseases 70

Biochemistry 70

MAIZE

Crop Improvement 71

- Germplasm 71
- Heterosis 71
- Superior composites 71
- Varieties for specific use 71
- Resistance to drought 72
- Biological nitrogen 73

Biochemistry 73

WHEAT

- Germplasm 73
- Development of superior varieties 73
- Time of sowing and performance 73
- Demonstrations 74

MINOR MILLETS

Crop Improvement 75
- Germplasm 75
- Superior varieties 75
- Resistance to pests & diseases 75

MILLETS

In Tamil Nadu, millets occupy 20 lakh hectares representing 25.3 per cent of the total cultivated area. Of this, sorghum is cultivated in 7.6 lakh hectares, cumbu in 4.4 lakh hectares, ragi in 3.2 lakh hectares and minor millets in 4.8 lakh hectares. There has been a rapid spread of the cultivation of maize extending to an area of 20,000 hectares. More than 80 per cent of the area under millets are rainfed. The average yield in Tamil Nadu is 1.0 t/ha for sorghum and ragi, 0.8 t/ha for cumbu and 0.2 to 0.4 t/ha. for other millets. It is therefore important to increase the yield level of these crops to increase the income of the farming community. The traditional varieties are suited mainly for fodder needs of the cultivators. The recently released hybrids with high grain yield potential are poor fodder yielders and are developed mainly for irrigated conditions. Therefore, research efforts are intensified to step up production of major millets through development of high yielding varieties/hybrids with resistance to pests, diseases and drought besides evolving grain-cum-fodder cultivars.

In cumbu and maize downy mildew disease has assumed serious proportions in recent years. Hence, development of varieties resistant to this disease has gained importance in our breeding programme. Maize has currently assumed importance in view of the industrial use of the grain and consequent remunerative potentialities of the crop besides the relative ease with which it can be grown. Hence, concerted efforts are being directed towards improvement of this crop.

With the introduction of new non-photosensitive and fertilizer responsive varieties and hybrids, continuous cropping extending to all the seasons have become a regular practice. This has rasulted in the vulnerability of crops to heavy incidence of pests and diseases resulting in reduced yields. The cost of fungicides and pesticides has also gone up by leaps and bounds. Further the pathogens and pests also develop resistance to these chemicals on account of their frequent use. All these factors emphasize the need for breeding resistant varieties of crop plants to combat the maladies. The current research thrust on millets is designed to fulfill the above requirements and the salient features of work carried out are presented hereunder.

Sorghum

Crop Improvement

Germplasm : A germplasm collection of 2200 genotypes are maintained and utilised in the breeding programme at Coimbatore.

During summer and monsoon season of 1980, 47 crop combinations were effected to assemble disirable characteristics with improved agronomic background. Eleven promising adapted lines were identified as source population for future use.

Seventy eight new accessions were added to the germplasm during this year.

Exploitation of heterosis : Attempts to evolve sorghum hybrids with high grain and fodder yields with suitability for summer season has resulted in the development of new hybrid USH 1 (2077A x 699T) which was released as COH3 (Plate11 and 12). It is tall in stature (225-250cm) and pearly white in colour and suited both for irrigated and rainfed culture recording 6095 kg and 2800 kg of grain/ha respectively as against 5320 kg and 2360 kg in K tall. COH 3 yielded 26.5 and 23.0 t/ha fodder as compared to 18.0 and 9, 6 t/ha in K tall, under irrigated and rainfed cropping, Besides, it is non-lodging, sweet stemmed, juicy and remains green even at harvest. It is tolerant to major pests and diseases and to the witch weed, striga.

Further, evaluation of 39 new hybrid combinations revealed that three hybrids viz., 648 A x Co 24, 3675 A x Co 24 and 10446 A x 69 are promising by their high yield potential under irrigated cultivation. (Table 39).

TABLE 39. Grain yield of sorghum hybrids (irrigated condition)

Hybrid		Grain yield (kg/ha)
648 A x Co 24		7650
3675 A x Co 24		7500
10446 A x 69		5185
CSH 5	check	4300
K Tall	check	4400

Two hybrids 3845 and 3852 were promising under rainfed conditions (Table 40).

Plate II COH 3 SORGHUM

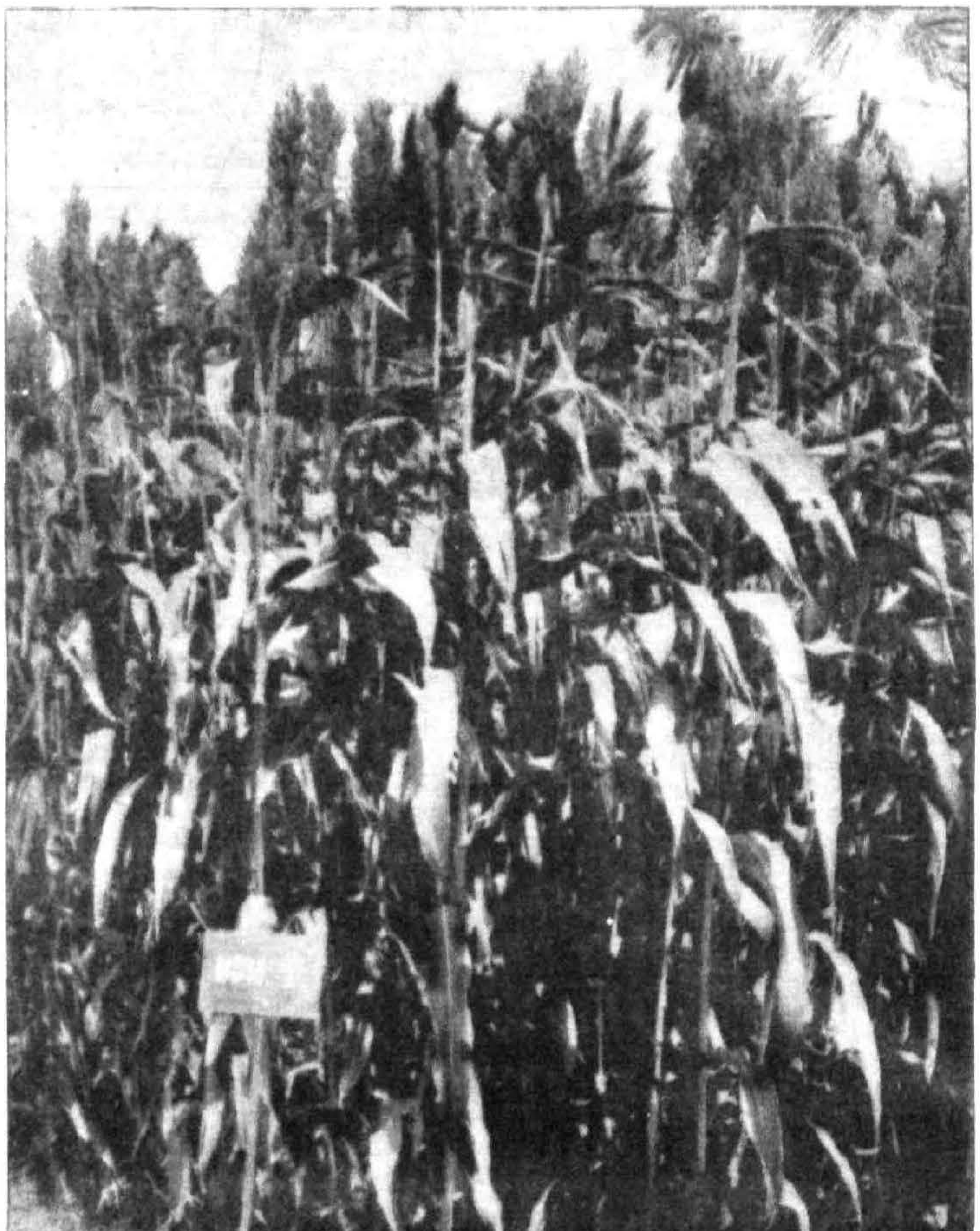


Plate.12 COH.3 SORGHUM EARHEADS

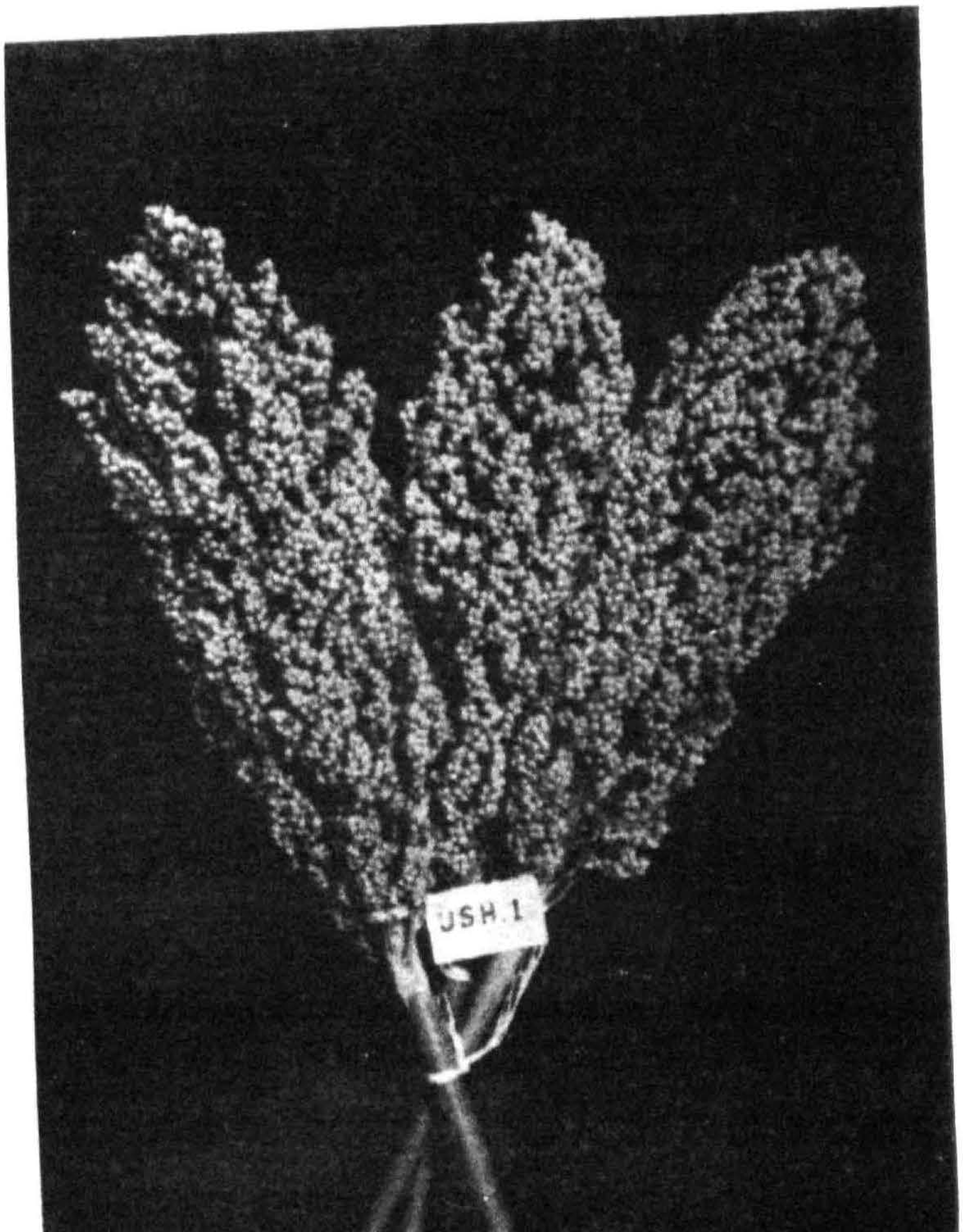


TABLE 40. Grain yield of sorghum hybrids (rainfed condition)

Hybrids		Grain yield (kg/ha)
3845		7322
3852		7121
CSH 5	check	5001
USH 1	check	6092
K Tall	check	5968

Development of stable hybrid derivatives : In our efforts to evolve better varieties than Co24 in grain and fodder yield, USV 12 was identified recording the highest grain yield of 5050 kg/ha followed by USV 4 registering 4680 kg/ha as against 4000 kg/ha in Co 24. These two cultures have since been advanced to adaptive research trials as well as to the coordinated trials, for testing across the wide agroclimatic regions.

From 1600 F_2s studied, a total of 1520 families were carried forward to the F_3 generation. From 48 F_4 families, 27 were advanced to F_5 generation.

Of the 20 cultures tested for evolving high yielding variety of sorghum suited to early south-west monsoon season, culture USV 7 recorded the highest grain yield of 5600 kg/ha as campared to 3464 in Co 24. The straw yield of USV 7 was 26.34 t/ha as against 21.19 in Co 24. USV 7 is being tested in the University Research Stations to confirm its stable performance.

Development of varieties suited to specific tracts: In certain areas of Salem and Madurai districts, redgrain varieties are preferred. Red-grained Dindigul selection developed at Madurai showed high yield potential (Table 41)

TABLE 41. Performance of red-grain sorghum selections at Madurai.

Selection	Grain yield (kg/ha)
Dindigul selection	5419
Chellampatty selection 2	3078
Usilampatty selection 2	3875
K 6 (Standard)	1158

Resistance to pests and diseases : In sorghum, the major diseases are downy mildew and head mould, the major pests being shootfly, stem borer, midge, earhead bug and leaf mite. Screening for resistance for the above disease and pests following suitable screening techniques has resulted in the identification of varieties resistant or tolerant to some of the diseases and pests. (Table 42).

TABLE 42. Reaction of sorgum varieties/hybrid to diseases and pests.

Variety/hybrid	*Resistance to*	Tolerant to
Co 21	Head mould, rust, leaf blight and striga	Downy mildew, stem borer and shootfly.
Co 22	Downy mildew, head mould rust and leafblight.	Shootfly and stem borer.
Co 23	Head mould, rust and leaf blight.	Downy mildew, stem borer and shootfly.
Co 24	Downy mildew and leaf blight	Head mould, rust, stem borer and shoot fly.
Hybrid, CoH 3	All diseaees	Striga, shootfly and stem borer.

Ten sorghum cultures were observed to show varying levels of resistance to different pests and diseases and they are in various stages of yield trials (Table 43).

TABLE 43. Resistance to pests and diseases in sorghum cultures.

Culture	Disease				Pest	
	DM	HM	LB	Rust	SF	SB
USV 6	R	R	R	R	MR	MR
USV 7	R	R	R	R	MR	MR
USV 8	R	MR	R	R	R	R
USV 9	R	R	R	R	R	R
USV 10	R	R	R	R	R	R
USV12, 13, 14, 15, 16	R	MR	R	R	MR	MR

DM — Downy Mildew LB — Leaf Blight SB — Stem Borer

HM — Head Mould SF — Shootfly R — Resistant

MR — Moderlately Resistant.

Resistance to drought : Sorghum varieties were tested at the Regional Research Station, Paiyur and four promising short duration cultures, DPI 1225, 1226, 1227 and 1288 were isolated for further trials. They matured in 90 - 95 days while the local' Talaivirichan' type took 140 - 150 days.

Crop Management

Cropping systems : Intercropping has received importance because of additional grain production in unit area in unit time. It also increases the soil fertility by improving the nitrogen status of the soil. Two main combinations tried were sorghum - cowpea grain and sorghum-cowpea fodder.

Sorghum - cowpea combination in two/one row arrangement was found to be superior in overall production by recording on an average grain yield of 4775 kg of sorghum and 257 kg of cowpea. Among the nitrogen levels, 80 kg N and 120 kg N were on par. Under 80 kg N, sorghum cowpea combination recorded the maximum grain production of 5424 kg and 295 kg per hectare respectively. Raising cowpea as intercrop for fodder resulted in reduction in yield of sorghum (**Tables 44 and 45**).

TABLE 44. Intercropping trial with Sorghum (grain yield In kg/ha)

Cropping system	N (kg/ha) 0		40		80		120	
	Sorghum	Intercrop	Sorghum	Intercrop	Sorghum	Inter crop	Sorghum	Intercrop
Sorghum	3137	—	4607	—	5068	—	5140	—
Sorghum + cowpea grain	3211	204	4904	252	5424	295	5562	272
Sorghum + cowpea fodder	3120	4365	4555	5732	4863	6848	5072	7145

TABLE 45. Economics of Inter cropping Trial with Sorghum Rs/ha

Treatments	N kg/ha			
	0	40	80	120
Sorghum alone				
Gross income	3331	4836	5321	5397
Cost of cultivation	2400	2600	2800	3000
Net income	931	2236	2521	2397
Return per rupee	1.38	1.86	1.90	1.79
Sorghum+Cowpea grain				
Gross income	3779	5653	6285	6384
Cost of cultivation	2510	2710	2910	3110
Net income	1269	2943	3375	3274
Return per rupee	1.50	2.08	2.15	2.05
Sorghum+Cowpea fodder				
Gross income	2930	5642	6133	6397
Cost of cultivation	2550	2750	2950	3150
Net income	1380	2892	3183	3247
Return per rupee	1.54	2.05	2.07	2.03

For getting higher return also, sorghum + cowpea grain raised at 80 kg N is the best.

Nursery techniques : Experiments were conducted with Co 22 sorghum to develop economic nursery management and to find out how long the sorghum seedlings can be kept in the nursery without affecting the yield. The results have indicated that super seedlings raised in sand+FYM medium have given the highest yield at 4590 kg/ha when they were retained in the nursery for 24 days as against the conventional 18 days old seedlings. Earliness in flowering in the crop was noticed in the case of super seedlings. (Tables 46 & 47 and Fig. 8.)

TABSE 46. Comparison of nursery management techniques and sorghum yield

Treatments		Yield (kg/ha)
T1 Super seedlings in sand + FYM medium		4437
T2 Super seedlings in black soil medium		4388
T3 Super seedlings in red soil medium		4376
T4 Seed treatment with 5% potassium dihydrogen phosphate		4216
T5 Seed treated with 1% cobalt nitrate		4178
T6 Control (conventional nurseroy)		3960
	C. D.	299.0

FIG. 8 NURSERY TECHNIQUES FOR TRANSPLANTED SORGHUM

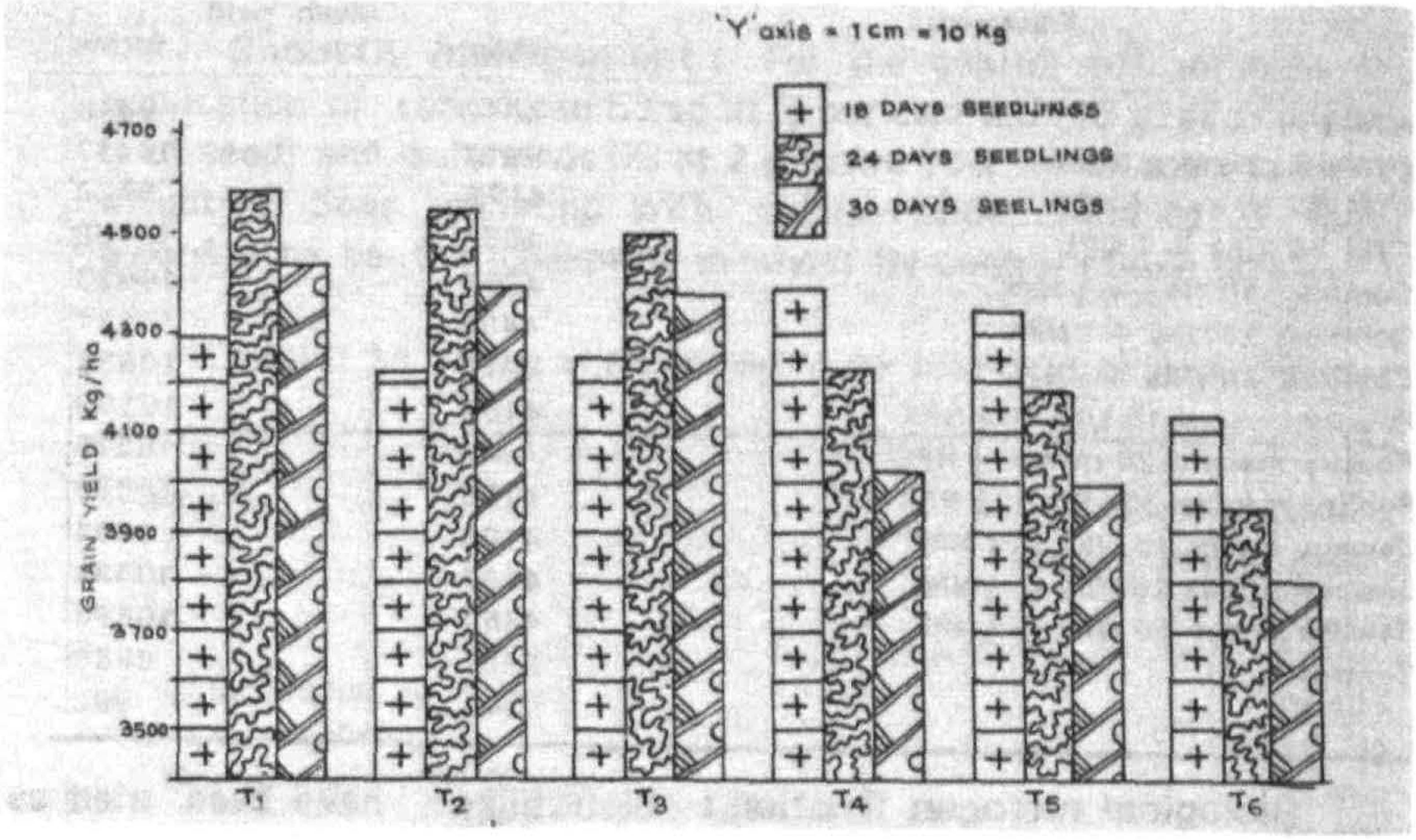


TABLE 47. Trial on nursery techniques for transplanted sorghum

Age of seedlings	T1	T2	T3	T4	T5	T6
A1 18 days	4289	4222	4248	4390	4349	4137
A2 24 days	4590	4552	4502	4229	4186	3946
A3 30 days	4432	4389	4378	4030	3997	3801
				C. D.		75.37

Combined application of organic manure and fertilizers : A study on the efficient utilization of available farm resources like farm yard manure, compost, poultry manure and sewage sludge revealed that the addition of organic wastes with inorganic fertilizers has significantly increased the grain and straw yield of CSH 5 sorghum. Application of FYM or compost at 30 t/ha plus 45 : 22.5 : 22.5 kg of N : P_2O_5 : K_2O/ha increased grain yield by 20.0% over control and 14.7% over inorganic fertilizers alone (full NPK of 90 : 45 : 45 kg/ha) (Table 48). The increase was 25.0% and 17.6% over control and NPK only respectively. The maximum grain yield of 4750 kg/ha was recorded in the treatments which received compost or poultry manure at 30 t/ha plus half the recommended dose of NPK. Organic manures in combination with inorganic fertilizers were significantly superior to control and inorganic fertilizers alone, in increasing the grain and straw yield of CSH 5 sorghum.

TABLE 48. Sorghum grain and straw yield (kg/ha)

Treatments	Mean yield	
	Grain	Straw
NPK (90:45:45)	4142	9445
FYM 10 t/ha + ½ NPK	4417	10417
FYM 20 t/ha + ½ NPK	4108	9722
FYM 30 t/ha + ½ NPK	4058	10139
Compost 10 t/ha + ½ NPK	4292	10833
Compost 20 t/ha + ½ NPK	4483	11111
Compost 30 t/ha + ½ NPK	4750	10833
Poultry manure 10 t/ha + ½ NPK	4483	10139
Poultry manure 20 t/ha + ½ NPK	4444	10278
Poultry manure 30 t/ha + ½ NPK	4750	10833
Sewage sludge 10 t/ha + ½ NPK	4108	9861
Sewage sludge 20 t/ha + ½ NPK	4267	10694
Sewage sludge 30 t/ha + ½ NPK	4350	10695
Control	3958	8889
CD at 5%	346	992

Biological nitrogen fixation : Biofertilizers have been tried as a substitute and supplement to chemical fertilizers to reduce cost of cultivation. *Azospirillum* inoculation was given to seed and soil and this was compared with full dose of nitrogen and also with reduced levels. The results of the experiment conducted under irrigated conditions with CSH 5 sorghum have shown that inoculation of *Azospirillum* in combination with N has increased the yield of sorghum (Table 49.)

TABLE 49. Effect of *Azospirillum* on sorghum yield

Treatment		Yield (kg/ha)
N0	Control (No nitrogen)	3067
N1	40 kg N at sowing + 40 kg N as top dressing	5337
N2	*Azospirillum* + N1	5799
N3	30 kg N at sowing + 30 kg N as top dressing	4837
N4	*Azospirillum* + N3	5200
N5	40 kg N at sowing	4038
N6	*Azospirillum* + N5	4313
N7	20 kg N at sowing + 20 kg as N top dressing	4114
N8	*Azospirillum* + N7	4551
N9	20 kg N at sowing	3551
N10	*Azospirillum* + N9	3704
N11	10 kg N at sowing + 10 kg N as top dressing	3591
N12	*Azospirillum* + N11	3679
N13	*Azospirillum* alone	3080
	C. D.	384.57

CROP PROTECTION

Shootfly management : For the control of sorghum shootfly application of carbofuran 50 sp at 5 per cent a.i. (10 g of chemical / 100 g. of seed) and isofenphos 5G at 2 g/metre row were found to be equally effective. Seed pelleting with chlorpyriphos (4ml/kg of seed) was e corded to be the cheapest, in shoot fly control (Table 50).

TABLE 50. Effect of insecticides in the control of sorghum shootfly

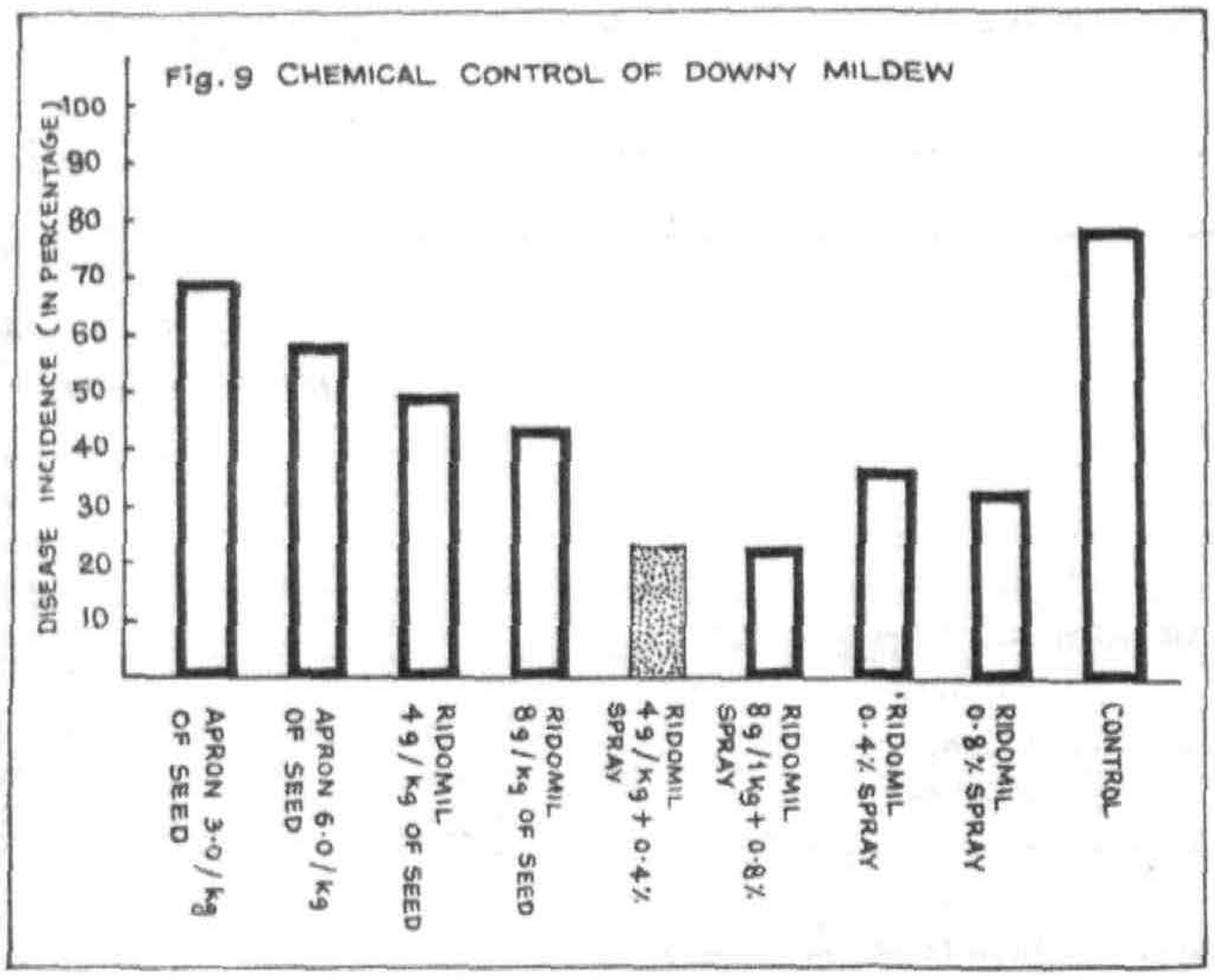
Treatments	Shootfly infestation (28 days after germination)
Chlorpyriphos 20 EC seed pelleting	2.40 (8.73)
Monocrotophos 40 EC seed pelleting	3.67 (11.00)
Phosalone 35 EC seed pelleting	2.90 (9.70)
Isofenphos 5G 2 gm/m. row	1.81 (7.60)
Bhendiocarb 1.5 gm/100 gm seed	3.23 (10.40)
Carbofuran 3 G 1.5 gm/m. row	2.47 (8.93)
Carbofuran SP 5% a.i.	0.97 (4.60)
FMC 3500 1.5 gm/m. row	3.01 (9.40)
Untreated control	11.65 (19.80)

Figures in parenthesis are transformed values

PLANT PATHOLOGY

Screening for resistance : Two hundred and seventy five sorghum cultures were screened for srghum downy mildew, leaf blight, trust and head mould infection. Among them, 47 cultures were modera-ely resistant to downy mildew, 20 to leaf blight, 33 to rust and 15 to head mould. Four cultures, viz., Co 22, CSV 4, CSH 6 and MSH 40, showed multiple resistance to all the above diseases.

Downy mildew management : Seed treatment with Ridomil 25 WP at 4 g/kg followed by a foliar spray at 0.4% on 40th day reduced significantly the downy mildew incidence to 24.7% as compared to 79.8% in control (Figure 9).



Leaf blight and rust management : Three sprays with Dithane Z-78 at 0.2% on 30, 45 and 60 days after sowing significantly reduced the incidence of leaf blight and rust disease (Table 51)

TABLE 51. Fungicidal control of sorghum leaf blight and rust

Treatment	Rust Mean grade	Leaf blight Mean grade	Grain yield (kg/ha)
Dithane Z-78 0.2%	0.6	1.0	3555
Zineb + Captan (1 : 1) 0.2%	1.3	1.3	2777
Ziram 0.2%	1.5	1.4	2222
Thiram 0.2%	1.4	0.9	2944
Thiovit 0.2%	1.4	1.2	2388
Ziram + Thiram + Thiovit (1:1:1) 0.2%	1.5	1.4	1888
Control	2.9	3.6	1611
C. D.	0.4	0.7	483

Head mould management : Spraying with a mixture of Captan 0.2% and aureofungin 200 ppm at flowering stage, milky stage and maturity minimised the head mould incidence from 79.8 to 24.8% besides increasing the yield by 68% (Table 52).

TABLE 52. Control of head mould disease of sorghum

Treatments	Incidence (%)	Grain yield (kg/ha)
Aureofungin 200 ppm	33.8 (35.5)	2407
Captan 0.2%	35.9 (36.7)	2370
Aureofungin 200 ppm + Captan 0.2%	24.8 (29.7)	2555
Dithane M.45 0.2%	65.8 (54.3)	1740
Dithane Z.78 0.2%	59.3 (50.3)	1851
Cuman L 0.2%	70.6 (57.2)	1592
Thiram 0.2%	47.3 (43.4)	2074
Thiram 0.2%+Cuman L 0.2%	42.3 (40.5)	2259
Difolatian 0.2%	79.2 (63.0)	1370
Control	79.8 (62.7)	1518
C. D. (0.05)	4.5	237

Figures in parenthesis are transformed values.

Seed Technology : Sorghum seeds were infected with *Fusarium moniliforme* which reduced germination, yield of straw and grain besides dwarifng of plants. Seed treatment wirh Bavistin at 2 g/kg increased the growth rate of plants appreciably and increased the straw and grain yield significantly (Fig. 10).

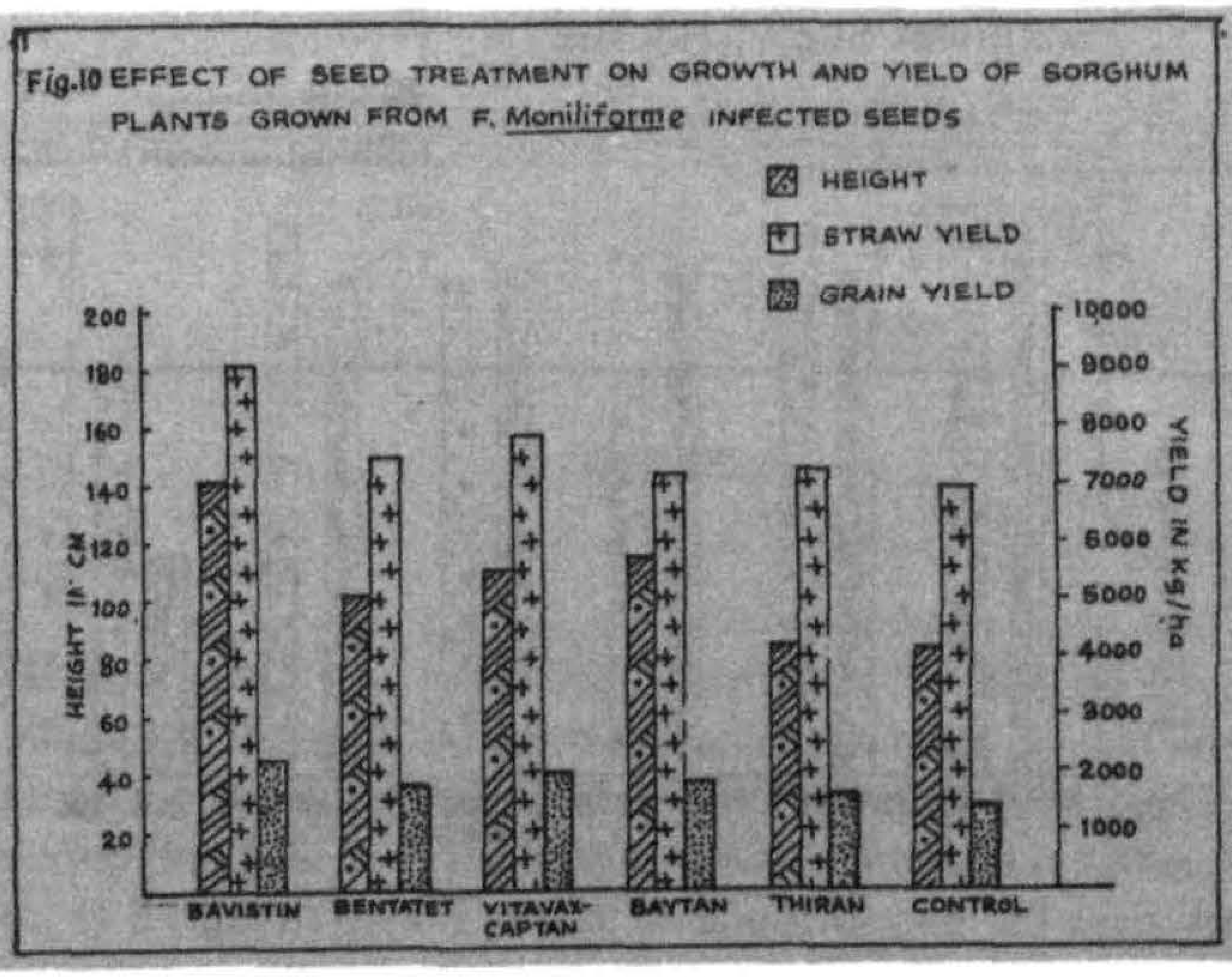


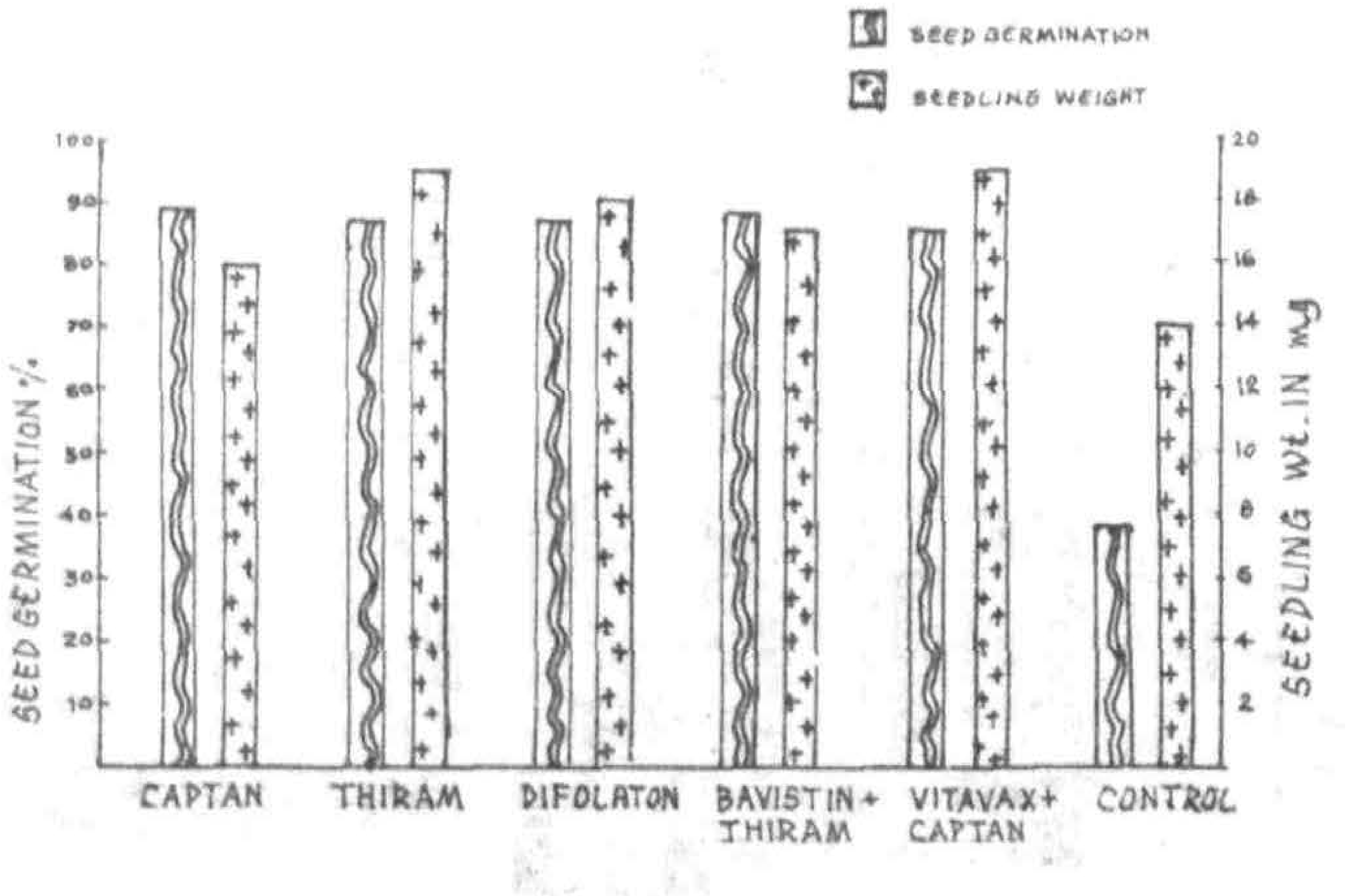
Fig.10 EFFECT OF SEED TREATMENT ON GROWTH AND YIELD OF SORGHUM PLANTS GROWN FROM F. Moniliforme INFECTED SEEDS

Sorghum seeds (Co 21) were harvested and dried to two different moisture levels. Nine fungi were detected in these seeds before storage. Five of them invaded layers beneath the seed coat surface. Such invasion was more in seeds with high moisture than in seeds with low moisture. The seeds were treated with five different fungicides at 4g/kg of seed and stored in cloth bags. After 15 months of storage, seeds were drawn and their external and internal seed-borne fungal populations were assessed. Both Captan and Difolatian completely eliminated seed coat infestation while Thiram teatement showed trace infestation of *Aspergillus flavus* and *A. niger* at 8.5% moisture seed

Sorghum seeds with 13.5% moisture content showed more external and internal infestation.

All the fungicide-treated seeds with initial moisture content of 8.5% maintained viability even after 15 months of storage while the untreated seeds lost their viability. Seedling vigour was less affected after 15 months of storage treated with fungicides. Except Captan, other fungicides could protect viability of seeds with high initial moisture content to a limited extent. Treatment with fungicides also preserved seedling vigour to an appreciable extent (Fig. 11).

Fig.11 EFFECT OF FUNGICIDE TREATMENT ON SORGHUM SEED STORAGE



Seed hardening in rainfed sorghum : Seed hardening with 10% potassium dihydrogen phosphate for 12 hours resulted in higher grain yield than water soaking or no soaking in both monsoon seasons (Table 53).

TABLE 53. Effect of soaking sorghum seeds in KH_2PO_4

Treatment	Grain yield (kg/ha)	
	Kharif Co 21	Rabi Co 22
1. Soaking in 10% KH_2PO_4	1685	1633
5. Soaking in distilled water	1440	1537
3. Control	1154	1149

The protein, lysine and tannin content of sorghum grains were analysed. The mean protein value was found to be 10.71% and the mean lysine content was 2.09 g/100g protein. The tannin content in the grains of these varieties was found to be below 0.5% which is under tolerable limit (Table 54).

TABLE 54. Protein, lysine and tannin contents of certain varieties of sorghum grains

Variety	Protein (%)	Lysine (g/100g protein)	Tannin (%)
Co 20	12.80	2.20	0.54
Co 21	9.84	2.03	0.45
Co 22	9.51	1.93	0.43
Co 23	10.24	2.69	0.42
Co 24	10.12	2.21	0.34
Mean	10.71	2.09	0.45

CUMBU

Crop Improvement

Germplasm : A gene pool consisting of 3500 genotypes is being maintained. Of these, 2500 were raised in the main season and the rest in the summer season and studied. Two hundred new accessions have been added during this year. Evaluation of these materials resulted in the identification of 51 genotypes resistant to shootfly and 23 resistant to downy mildew.

Exploitation of Heterosis : Efforts to develop hybrids superior to X4 with a duration of 85-90 days, suitable for irrigated and rainfed conditions are underway. A hybrid combination UCH 9 has been synthesised and is under test in the Station trials as well as in adaptive research trials (Plate 13). Besides, a dwarf version of male sterile line PT 732/A was developed from the original medium tall B line (Plate 14). Utilising this, a new hybrid UCH 10 has been developed and is under test.

Development of superior populations : *In a programme to* improve the variety Co 6 and to develop superior cumbu populations, top crosses were effected with Co 6 as the common parent and different populations and inbreds as the non-common parents. Twenty progenies from the combination involving Co 6 and K 560 possessing round, bold and white grains and a good set have been selected and are under study.

Resistance to pests and diseases : Careful and rigorous selection *in cumbu has resulted in the release of* Co 6 *which is highly* resistant to the dreadful downy mildew disease and tolerant to rust. The newly released X 4 hybrid also through its male parent PT 1921 inherited high resistance to downy mildew. Five backcross derivative lines form the combination of the best combiner T 23 D2B with the best source of resistance J 126 D2B are maintained for study of their combining ability to serve as useful seed parents.

Crop Protection

Among 1200 germplasm types of cumbu screened both under field and artificial conditions 25 inbred lines viz., IP 18, 44, 45, 230, 264 330, 394, 403, 430, 452, 562, 830, 881, 1055, 1140, PT 813/3, 818/10, 137/3, 1518, 1532, 1577, 1670, 1726, 1751 and 1824 and four male sterile lines MS 5645A, 5711A, 5054A and J 126 D2A were identified as highly resistant to downy mildew disease. Hybrid X4 which was resistant to downy mildew was released during the year.

A comparison of the incidence of downy mildew disease in direct sown and transplanted crops showed that in transplanted crop, the disease incidence was markedly reduced even in a suceptible variety as compared to direct sowing (Fig. 12).

Plate : 13 HYBRID UCH 9 CUMBU

Plate.14 732 A MALE STERILE LINE CUMBU WITH INDIGENOUS CYTOPLASM DEVELOPED AT TNAU, COIMBATORE

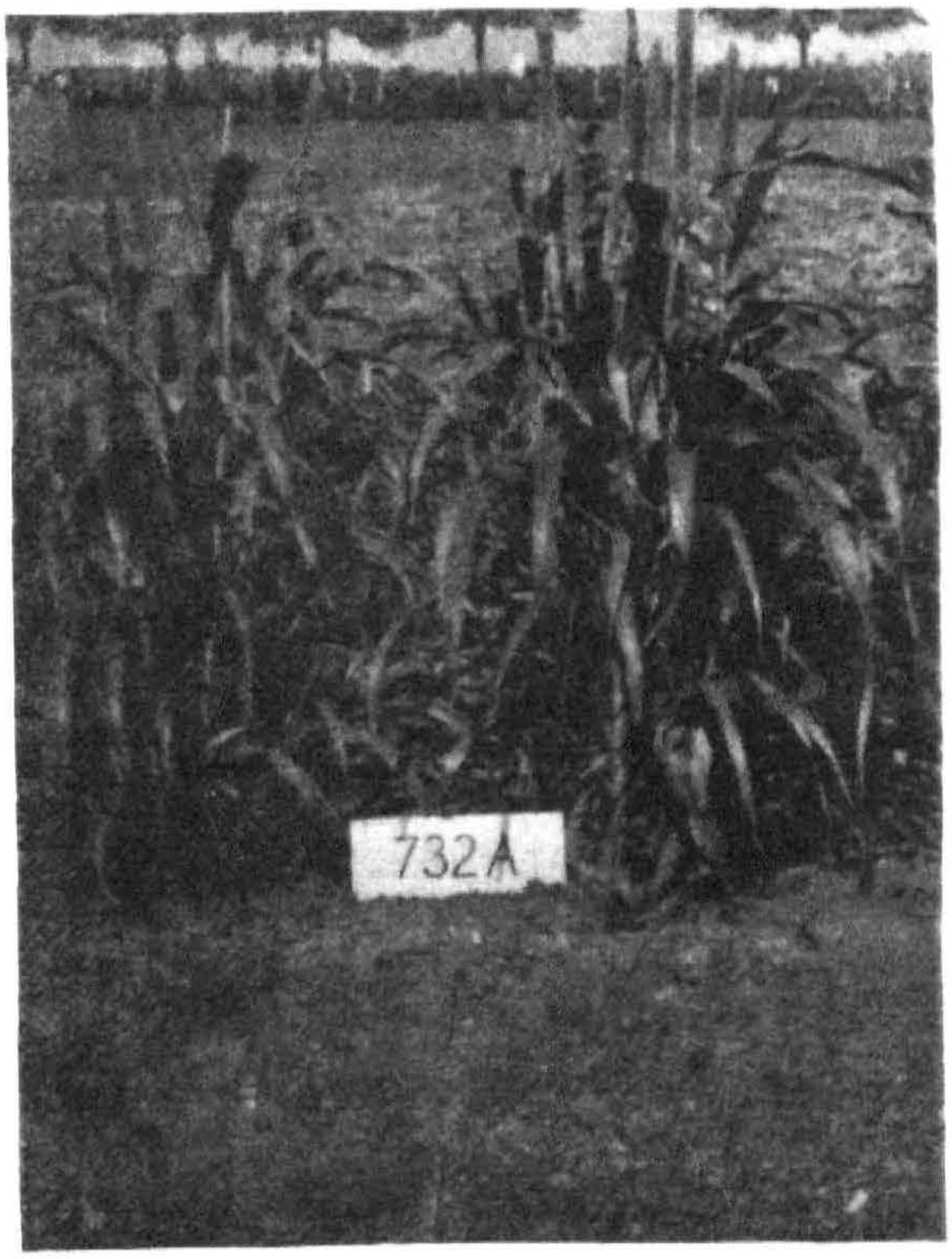
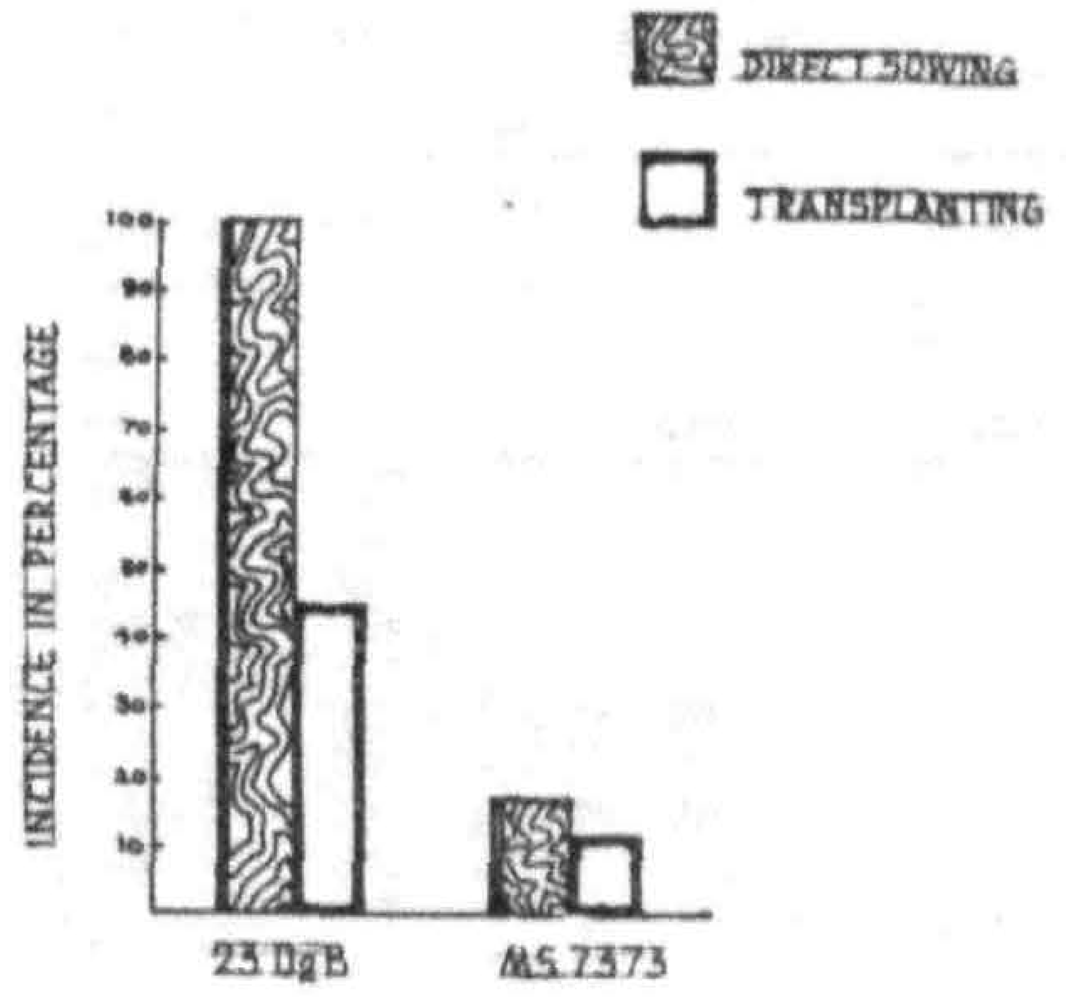
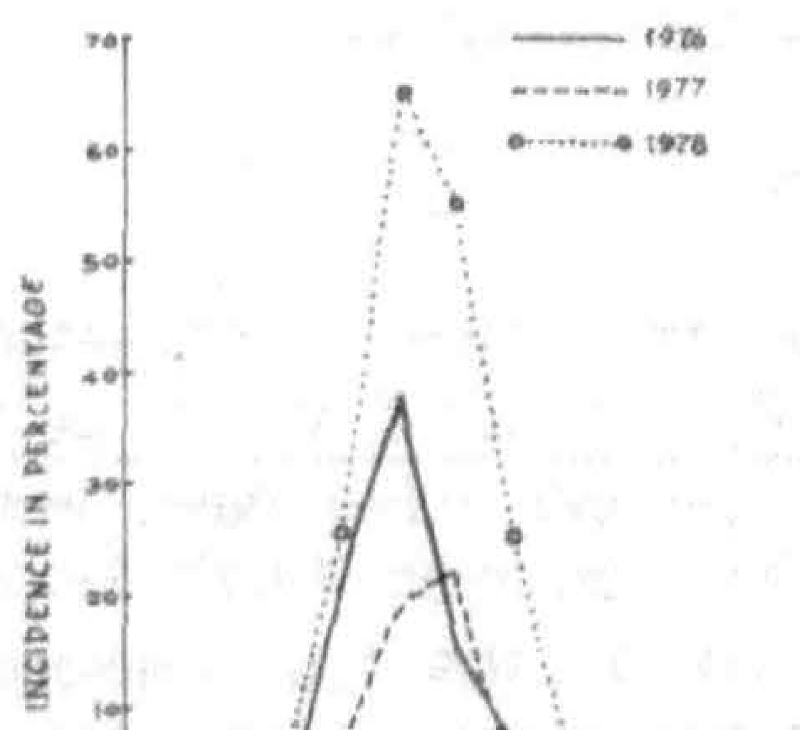


Fig. 12 EFFECT OF TRANSPLANTING ON DOWNY MILDEW OF CUMBU



Experiment on time of sowing revealed that crops sown from November to July escaped ergot infection while crops sown from August to October showed severe incidence of ergot (Fig. 13).

Fig. 13 EFFECT OF DATE OF SOWING ON ERGOT OF CUMBU



Downy mildew of cumbu was effectively controlled by treating the seed with Ridomil, a systemic fungicide at 8g/kg followed by one foliar spray at 0.1 per cent 20 days after sowing (Table 55).

TABLE 55. Effect of fungicides on control of downy mildew of cumbu in male sterile line 23 D2B

Treatment	Downy mildew (per cent)	Yield (kg/ha)
Seed treatment with Ridomil at 8g/kg of seed	54.0	216
Seed treatment with Ridomil + one spraying at 0.1% 20 days after sowing	5.5	461
Seed treatment with Demosan at 8g/kg of seed	97.9	36
Seed treatment with Demosan + one spraying	96.9	52
Seed treatment with Bafin at 8g/kg of seed	98.0	18
Seed treatment with Bafin 8g/kg of seed + one spraying	96.8	51
Untreated check	98.9	36
C.D.	11.3	24.9

RAGI

Crop Improvement

Development of Supperior varieties

A. Irrigated condition

One hundred and forty hybrid derivatives are under various stages of yield trials. Five cultures which performed better than the standard Co 11 in four seasons have been enterred into co-ordinated yield trials. Of these, two cultures TNAU 169 and TNAU 167 which have outyielded Co 11 in all the four seasons, recording mean increases of 27.8 and 21.4 respectively have been advanced to adaptive research trials. The results are presented in Table 56. (Fig. 14).

The method of hand emasculation was standardised using the humidity control for flower opening and successful F_1 seed have been obtained.

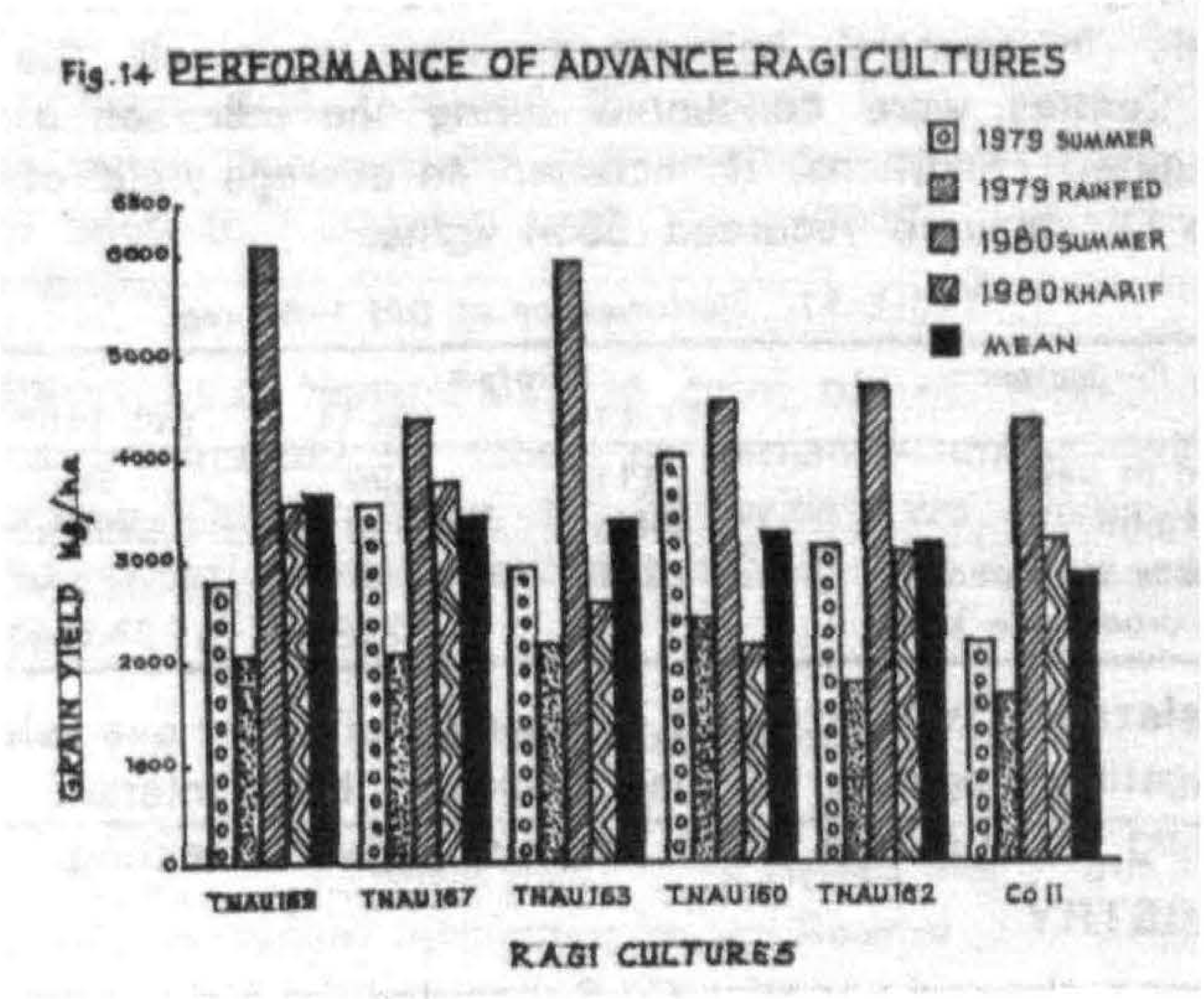


TABLE 56. Performance of elite ragi cultures

Entry	Percentage	Duration (days)	Yield in (kg/ha) 1979	1979	1980	1980	Mean	Percentage over Co 11
TNAU 169	ECW 1360/1-5 x Co 11	95	2802	2085	6078	3547	3628	27.8
TNAU 167	,,	95	3555	2075	4396	3760	3447	21.4
TNAU 163	ECW 1360/1-5 x Co 10	95	2894	2162	5919	2575	3388	19.3
TNAU 160	,,	95	3987	2406	4548	2123	3266	15.0
TNAU 162	,,	90	3131	1749	4694	3049	3156	11.1
Co 11	Check	95	2172	1622	4357	3210	2840	

B. Rainfed condition

In the studies conducted at the Regional Research Station, Paiyur to identify suitable variety of ragi for rainfed tracts of Salem and Dharmapuri districts the culture DPI 1161 eminently suited to this tract was selected. Under rainfed condition, it gave a mean yield of 2482 kg/ha, against the standard Co 11 with 939 kg/ha of grain yield.

The mean yield particulars are furnished in Table 57. Besides high grain yield, it is tall in stature possessing open long panicles with more than six fingers which are desirable features for rainfed ragi. Large scale trials in farmers' holdings as well as in all the University Research Centres were conducted during the monsoon of 1980 - 81. Under irrigated conditions, it recorded an average yield of 5798 kg/ha while Co 11 standard recorded 3534 kg/ha.

TABLE 57. Performance of DPI 1161 ragi

Particulars	Rainfed		Irrigated	
	DPI 1161	Co 11	DPI 1161	Co 11
Duration in days	111	90	99	93
Yields kg/ha	2482	939	5798	3534
Percentage over control	265	100	165	100
Per day production kg/ha	22.36	10.8	58.5	38.0

Resistance to pests and diseases : Twenty one selections from the segregating progenies of the crosses of blast tolerant types with high yielding varieties are under various stages of testing.

BIOCHEMISTRY

Among the ragi varieties Co 6 recorded the highest protein content of 12.54 per cent. Feeding experiments with animals showed that the digestibility of the ragi varieties Co 10 and Co 11 were 88.2 per cent and 89.9 per cent respectively. The variety PT 825/2 among 37 cumbu varieties, had the highest protein content of 15.71 per cent. Thevariety X-4 had higher digestibility (91.6 per cent) than Co 6 (89.0 per cent).

The protein content of some millet varieties is presented in Table 58.

TABLE 58. Protein content and digestibility of some millet varieties

Variety	Protein (%)	Digestibility (%)
Cumbu		
X-4	10.30	95.65
Co 6	9.37	89.04
Ragi		
Co 10	6.92	88.20
Co 11	7 94	89.80
Tenai		
Co 3	8.38	84.28
Co 5	10.38	83.45
Kudiravali		
Co 1	7.88	—
EF2	10.25	—
Panivaragu		
Shyam cheena	13.10	—
Co 1	11.54	—

MAIZE

Crop Improvement

Germplasm : A total of 450 inbred lines have been added to the gene pool. This includes 235 additions made during this year. These have been top crossed with EH. 400175 for study of their combining ability.

Exploitation of Heterosis : A total of 166 hybrids have been developed and evaluated for their performance under irrigated and rainfed cropping. Out of these, the following two combinations were identified for superior grain yield potentiality and resistance to downy mildew disease (Table 59).

TABLE 59. Performance of promising maize hybrids

Hybrids	Grain yield (kg/ha)	% increase over Ganga 5	Downy mildew incidence (%)
UMI 32 x UMI 130	5310	66.1	7.1
UMH 3 x UMI 140	4432	38.6	3.2

In the Zonal coordinated trial, UMH 3 ranked second and yielded 5543 kg/ha recording 14.5 per cent increase over the all-India check J 603.

Development of superior composities : UMC 5 is a composite of TNAU derived from Indonesian materials. It showed low incidence of downy mildew (3.5 per cent) and yielded 4624 kg of grain/ha out-yielding Ganga 5 by 44.7 per cent. It is under adaptive research trial. UMC 9 is another composite, constituted from superior combiners with Suwan 1 and Suwan 2, showed tolerance to downy mildew and gave high yields, at Bhavanisagar and Coimbatore.

Improvement of varieties for specific use : UMC 3 is a pop corn composite developed from 4 inbreds. It yielded 30 per cent more than local pop corn. The popping efficiency was similar to local pop corn.

Resistance to pests and diseases : Under the improvement programme of the existing downy mildew resistant maize varieties for

yield and suitability to rainfed farming system, the following inbreds from local collections were found free from downy mildew (Table 60).

TABLE 60. Maize inbreds resistant to downy mildew

Inbred	Origin
UMI 1	Salem (MS 1)
UMI 8	Pattukottai (MS 8)
UMI 9	Bhavani (MS 9)
UMI 10	Madurai Dt. (MS 10)
UMI 131	Pattukottai (PKT 4)
UMI 227	Pudukottai (PDK 4)

A single cross hybrid involving a Pattukottai inbred PKT 3 (UMI 130) with UMI 32, a cross devivative, yielded 5310 kg/ha besides low incidence of downy mildew (7.1%). Further, cross combinations involving local inbreds, for higher yield and downy mildew resistance, are being explored.

Resistance to drought : Studies carried out at Kovilpatti with the object of identifying suitable varieties of millets which will substitute the traditional varieties in the black soil tracts of Tamil Nadu have revealed the superiority of Deccan maize over sorghum or bajra in giving remunerative yield Table 61).

TABLE 61. Performance of millet varieties at Kovilpatti

Crop	Variety	No. of years of trial	Yield (kg/ha)	
			Grain	Straw
Maize	Deccan	3	1519	3741
	Ganga 5	3	1106	3773
Sorghum	K tall	4	1410	5474
	IS 3541	4	1116	6966
Bajra	UCH 4 (X_4)	3	993	3133
	KM 2	2	1044	4504
	K 1	2	732	2956
	Co 6	1	592	2743

Biological Nitrogen Fixation

Combined inoculation of Azotobacter and Azospirillum on maize : The effect of combined inoculation of *Azotobacter* and *Azospirillum* on Ganga 5 variety of maize with graded levels of nitrogenous fertilizer was studied at Bhavanisagar. The results indicated that the bacterial inoculants gave higher grain yield over uninoculated control at 75% and 100% of fertilizer nitrogen. The increase in yield varied from 2.4 to 20.2% over the respective control. Maximum yield of 3596 kg/ha was recorded in the treatment receiving *Azospirillum* along with 100% nitrogen, while the full dose of fertilizer nitrogen alone gave 2993 kg/ha recording 20.2% increase over the corresponding control. Among the two organisms, *Azosporillum* was more effective than *Azotobacter*. Individual inoculation either with *Azotobacter* or *Azospirillum* was better than the combined inoculation.

BIOCHEMISTRY

The biochemical study on protein and amino acid composition of maize showed that protein had negative correlation with lysine and tryptophan content, whereas lysine had positive correlation with trylophan.

WHEAT

Germplasm : A genetic stock of 290 lines is maintained and evaluated. Study of these types has resulted in the isolation of 35 lines showing promise and these are under test in yield trials.

Development of superior varieties : In the study for wheat genotypes suitable to Tamil Nadu, seven thermo insensitive bread wheat genotypes, *viz.*, HD 2189, DWR 16, NI 7851, NI 6988, NI 7026, NI 5439 and HD 1912, gave consistently high yields under Coimbatore conditions with a duration of 85 - 90 days. (Plate 15).

Pedigree selection from crosses received from CIMMYT resulted in the isolation of the derivatives 336-2-1, 320-5-1, and 314-3-1 which are high yielding and suitable for cultivation under Tamil Nadu conditions.

Time of sowing and performance of yield : Agronomic evaluation of wheat varieties under early, normal and late sown conditions were tried at Coimbatore and the results are summarised in Table 62.

TABLE 62. Time of sowing and yield performance of wheat

Wheat Variety	Early- 42nd Meteorological week- 23rd October sowing	Normal- 45th Meteorological week- 11th November sowing	Late- 49th Meteorological week- 5th December sowing
HD 2189	22.9	32.4	22.8
DWR 16	25.2	33.2	23.4
APAV 1560	15.4	18.4	20.8
NI 5439	29.8	31.5	16.2
DWR 26	15.6	24.2	15.1
NI 7861	28.5	29.0	27.9
CC 464	22.8	28.4	20.7
HD 4502	18.2	26.2	12.3
Sornaleka	23.7	26.3	24.2
DWR 21	12.4	21.2	20.2

The varieties NI 5439 and NI 7861 were found suitable for early sowing; HD 2189 and DWR 16 for mid November; the variety NI 7861 performed well in all the three sowings.

The varieties DWR 16 and BDN 519 did well with one irrigation at 21st day after sowing, While HD 2189 performed well with three irrigations (Table 63).

TABLE 63. Irrigation x Varieties

Yield (q/h)

Wheat Variety	One Irrigation	Two irrigations	Three irrigations
DWR 16	17.5	17.7	17.8
BDN 519	16.7	17.7	17.8
HD 2189	11.6	14.9	18.5
WSM 14	11.9	14.9	15.8
Bijang yellow	10.6	14.4	15.2

Demonstrations : Demonstrations conducted at farmers' holdings have brought out the possibility of wheat as a substitute crop in the districts of Coimbatore, Periyar and Dharmapuri. Under irrigated condition, it yielded 3250 kg/ha and under rainfed condition, 1250 kg/ha.

Plate 15 HD 2189 – A PROMISING WHEAT CULTURE

MINOR MILLETS

Crop Improvement

Germplasm : The following number of genotypes are maintained in the gene pool.

Varagu	: 800	Pani varagu	: 250
Samai	: 80	Kudiraivali	: 200
Tenai	: 440		

These are utilised in selection programmes. Varagu Co 3 and Kudiraivali Co 1 released recently are the result of vigorous sieving and effective selection procedure. One genotype A 113/2 of Japanese origin which was identified as resistant to rust was utilised in crosses. Promising derivatives obtained from these crosses are in advanced stages of trial.

Development of superior varieties

Panivaragu : Three entries PV 1685, MS 1595 and MS 4872 in the advanced trials gave higher yield than Co 1 in two trials in which they were tested. Their mean performance is furnished in Table 64.

TABLE 64. Performance of promising seletions of Panivaragu

Entry	Duration in days	Yield kg/ha	Per cent over Co 1
PV 1685	68	689.0	55.5
PV 1595	68	614.5	38.7
MS 4872	68	580.0	30.9
Co 1	77	443.0	

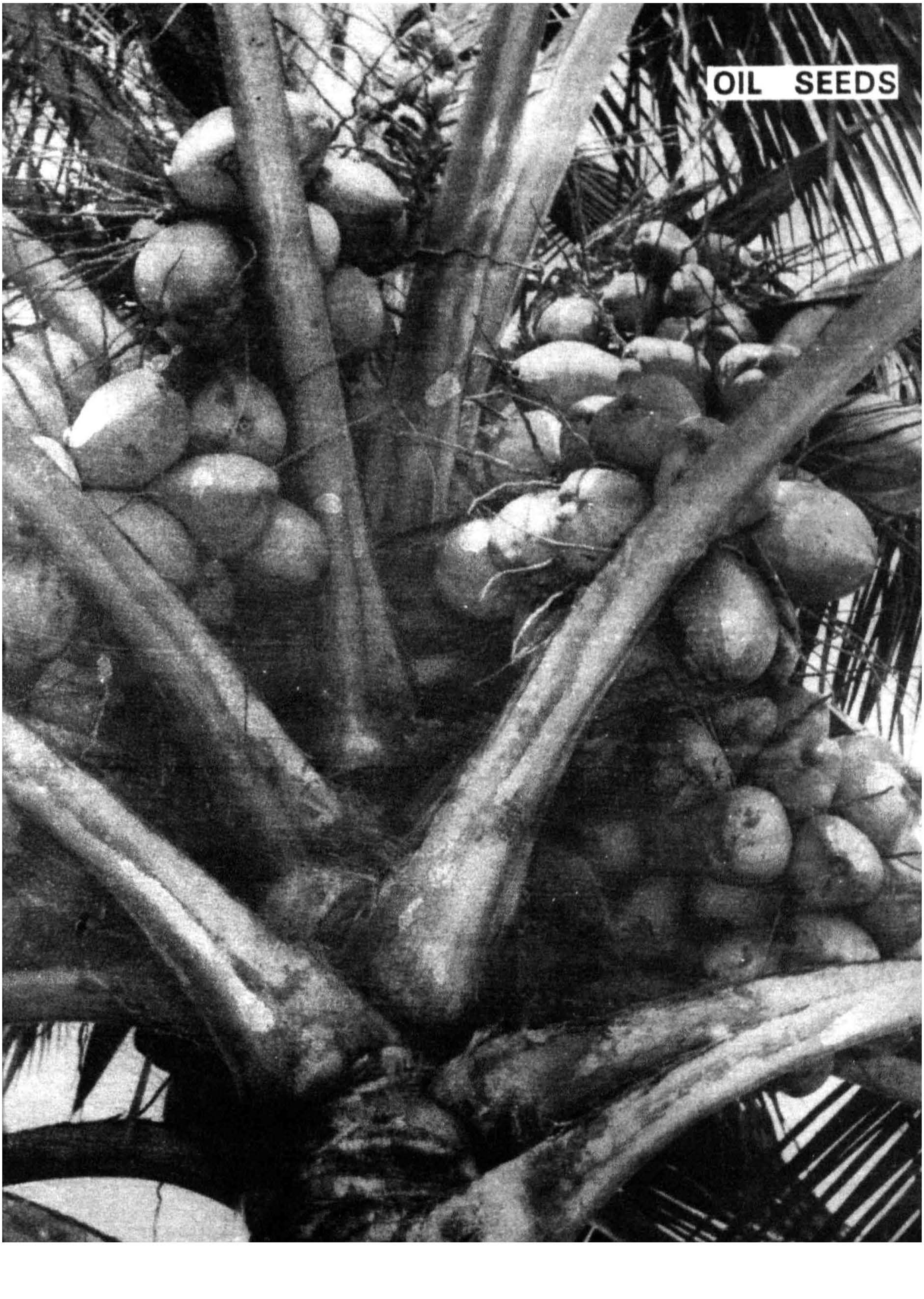
In the initial trial, MS 1337 and MS 1472 were the best yielders. They recorded mean yields of 829 kg/ha and 801 kg/ha respectively while the check Co 1 registered a mean yield of 502 kg/ha.

Resistance to pest and diseases

Tenai : Two rust resistant derivatives of the cross Co 4 x A 113/2, viz., ITS 69 and ITS, 69 were identified to be superior in grain yield, rust resistance and early maturity compared to the standard Co 5. These have a mean yield potential of 3000 kg/ha in a duration of 75-85 days against Co 5 giving the yield of 240 kg/ha in 95-100 days.

***

UCH 9 CUMBU


OIL SEEDS

CONTENTS

Crop Improvement 78

Breeding for yield 78
Groundnut 79
Gingelly 79
Sunflower 80
Cocount 81
Resistance Breeding 82
Groundnut 82
Gingelly 82
Sunflower 82

Soil Management 83

Gingelly 83
Response to micronutrients 83

Crop Management 84

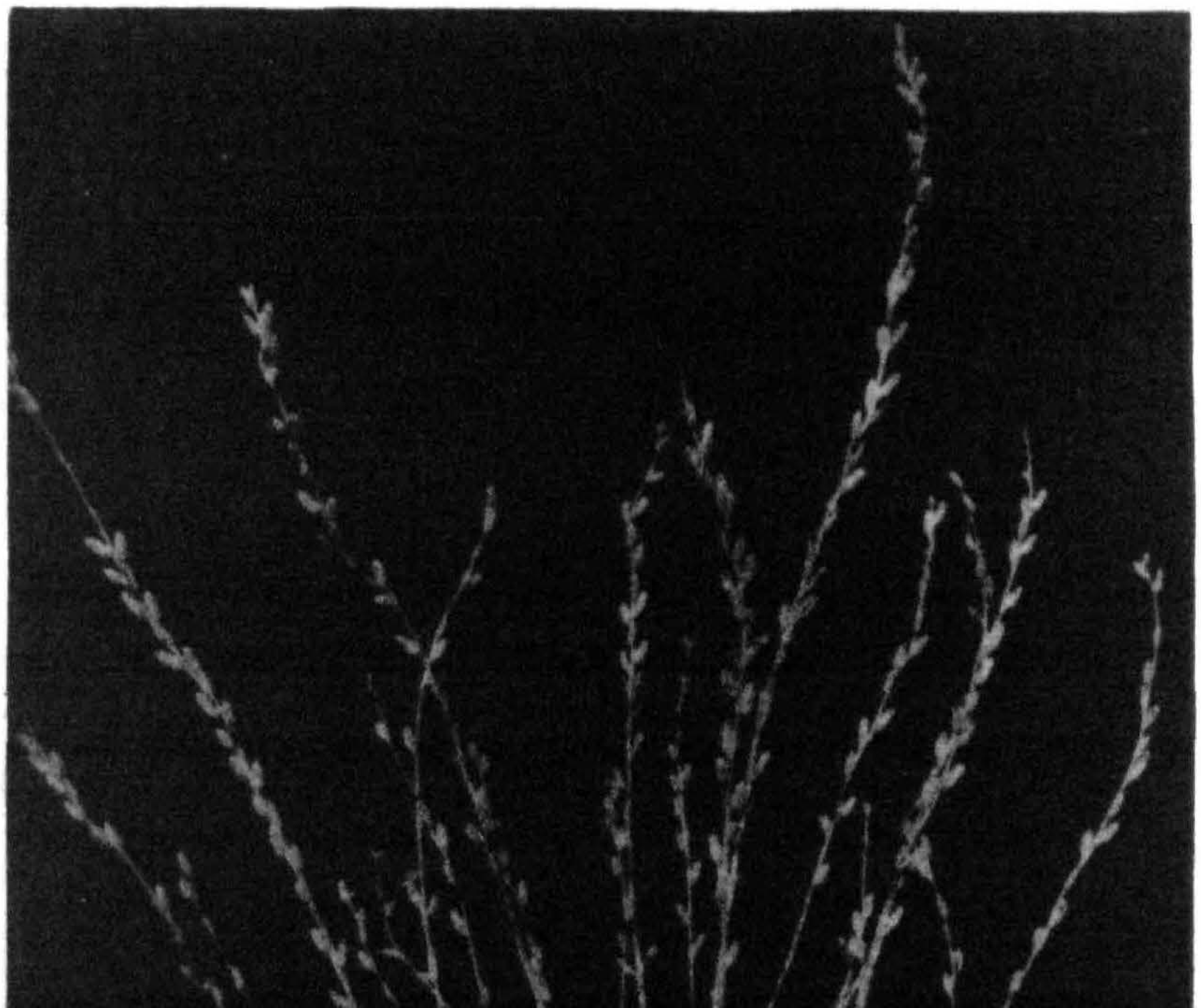
Groundnut 84
Crop - weed competition 84
Effect of weather on yield 84
Sunflower 84
Crop weed competition 84
Mixed cropping 85
Coconut 85
Intercropping of Cocoa 85

Crop Protection 86

Groundnut 86
Collar - rot 86
Ring - mosaic 86
Gingelly 87
Powdery mildew and Leaf blight 87
Sunflower
Foliar diseases 88
Castor 88
Semilooper 88
Coconut 88
Rhinoceros Beetle 88
Thanjavur Wilt 89
Tapering Stem Wilt 89
Physiology 90
Groundnut 90

Bio - chemistry 91

Microbiology 91



TNAU 2 GINGELLY

OILSEEDS

Crop Improvement

The major oilseed crops of Tamil Nadu are groundnut, gingelly, castor and coconut occupying 9.4, 1.0, 0.1 and 1.9 lakh hectares respectively. Sunflower is of recent introduction. Oilseed crops, by and large are grown under rainfed condition and at low levels of management. Besides weather aberration, poor plant population, inadequate plant protection, deficient supply of nutrients and insufficient post-harvest technology bring about low and unstable yields. The paucity of high yielding varieties adaptable to differing agro-climatic conditions is the major problem in oilseeds. The concept of improved plant type achieved successfully in cereals was also applied to groundnut, gingelly and sunflower and the features of the promising varieties are outlined below.

Breeding for yield

Groundnut

The analysis of the progenies of hybrids between the cultivated groundnut and the wild species *Arachis monticola* and *A. villosulicarpa* enabled the detection of bunch groundnuts with transformation in external morphology. The intensification of pod number per plant is a sequel to the upward shift in the number of secondary branches, basal nodes and pegs. Further, the derivatives displayed reduction in height of plant, area of leaflet, thickness of shell and field tolerance to diseases. From the progenies of the above crosses and those of infraspecific origin (represen-ted by double crosses, three-way crosses and backcrosses) 5100 selections, have been developed.

Two early maturing selections VG_1 and VG_4 were isolated at Vridhachalam centre from the progenies of crosses of the bunch (TMV 7) and semi-spreading (TMV 10) groundnuts with Robout 33-1; in these selections the duration was reduced by 10 and 25 days compared to TMV 7 and TMV 10.

A bunch culture (Mutant 3) derived from treatment of POL 1 groundnut with EMS, expressed a mean yield of 20 q/ha, The stability in yield of Mutant 3 is being adjudged under adaptive research trials. Genotypes of the Spanish, Valencia and Virginia groundnuts possessing different plasmons have been sorted out and these were employed in hybridisation

to synthesise varieties with new cytoplasmic backgrounds possessing desirable economic traits coupled with resistance to foliar diseases.

Breeding behaviour of experimental polyploids of *Arachis* conforming to three levels of ploidy viz., allotriploid (*A. hypogaea* x diploid *A. villosa*) and its hexaploid and the allotetraploid (*A. hypogaea* x autotetraploid *A. vilosa)* was studied to utilize these polyploids in furthering the genetic variability of cultivated groundnuts. Selective fertilization of gametes favouring the attainment of tetraploidy in the progenies facilitated by genomic reduction was the redeeming feature. The pattern of recombination and variation was found to be dependent upon the genotype of *A. hypogaea* used as the female parent in crosses with the synthetic allopolyploids.

Metaxenia was found to prevail by way of altered pod morphology in artificial, infraspecific and interspecific matings. This phenomenon facilitated the discrimination of crossed pods carrying kernels with 'hybrid' embryos from those developing from accidental self-pollination.

Gingelly

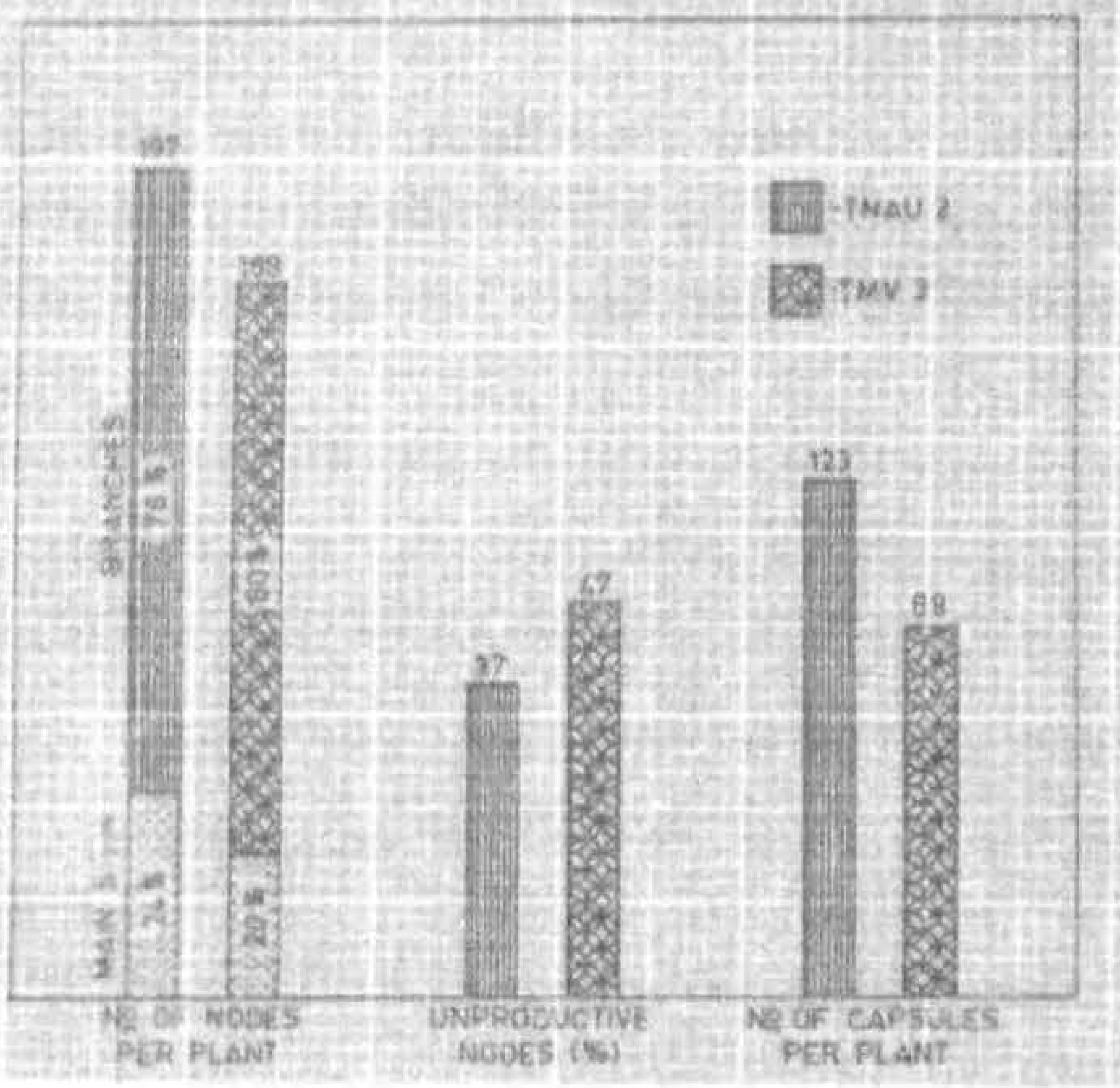
Though the improved varieties are better yielders than the local types, it is now obvious that a change in the morphology of the plant will lead to further improvement in yield. The existing cultivars exhibit open branching habit and long internodes and their flowers do not arise from lower leaf axils on the main stem and branches. The accession SI 1878 of Chilean origin is a monostemmed one with short internodes and close setting of capsules. The culture TNAU 2 was evolved from the progenies of the back cross of the hybrid of TMV 3 x SI 1878 with SI 1878. Plants of the above culture have acute branching habit and a duration of 85 - 90 days. The advancement in yield of TNAU 2 is a concomitance of not only an increase in the number of nodes but also a reduction in the percentage of unproductive nodes (Fig. 15).

In Advanced Yield Trails carried out during summer 1980, TNAU 2 recorded an yield of 792 kg/ha which was 34 per cent over TMV 3. The yields of TNAU 2 and TMV 3 in rainfed culture were 678 kg/ha and 515 kg/ha respectively.

The genetic diversity of the varieties points to the imminent necessity for exploitation of heterosis in this crop. Reciprocal crosses involving 21 genotypes in 15 combinations have been effected for identifying parental combinations exhibiting maximum heterosis for yield.

Fig.15

FACTORS CONTRIBUTING TO INCREASED YIELD IN TNAU 2



At Vridhachalam centre, the method of selfing gingelly flowers has been rendered simple by the application of semi-solid clay at the tip of unopened buds. A new method of emasculation of flowers has also been perfected. It consists of enclosing the style with a straw tube whose inner walls are moist and its free end flattened and bent. The humidity around the stigma appears to provide the optimum conditions needed for the germination of pollen grains after cross pollination.

Sunflower

Sunflower cultivation on a commerical scale started in 1972 with the introduction of Russian cultivars. This oilseed is perhaps one which can give the highest yield of seeds in a comparatively shorter period and better oil outturn per day of cultivation. Its low seed rate and high multiplication-ratio mark it out as far better than groundnut where one has to choose between the two crops. Poor seed set is a defect ascribed to the self-incompatibility mechanism. Setting up bee hives in sunflower fields and dusting the flower heads with pollen for a period of 10 days during the blooming phase enhanced the seed setting.

*Evaluation of exotic accessions resulted in the release of two improved strains, K 1 and K 2 with an yield potential of 10q/ha under rainfed culture. The origin of K 1 is from the entry EC 68414 and the progenitor of K 2 being a spontaneous mutant isolated in the population of EC 101495.

Plate :16 CULTURE SUF 2 SUNFLOWER

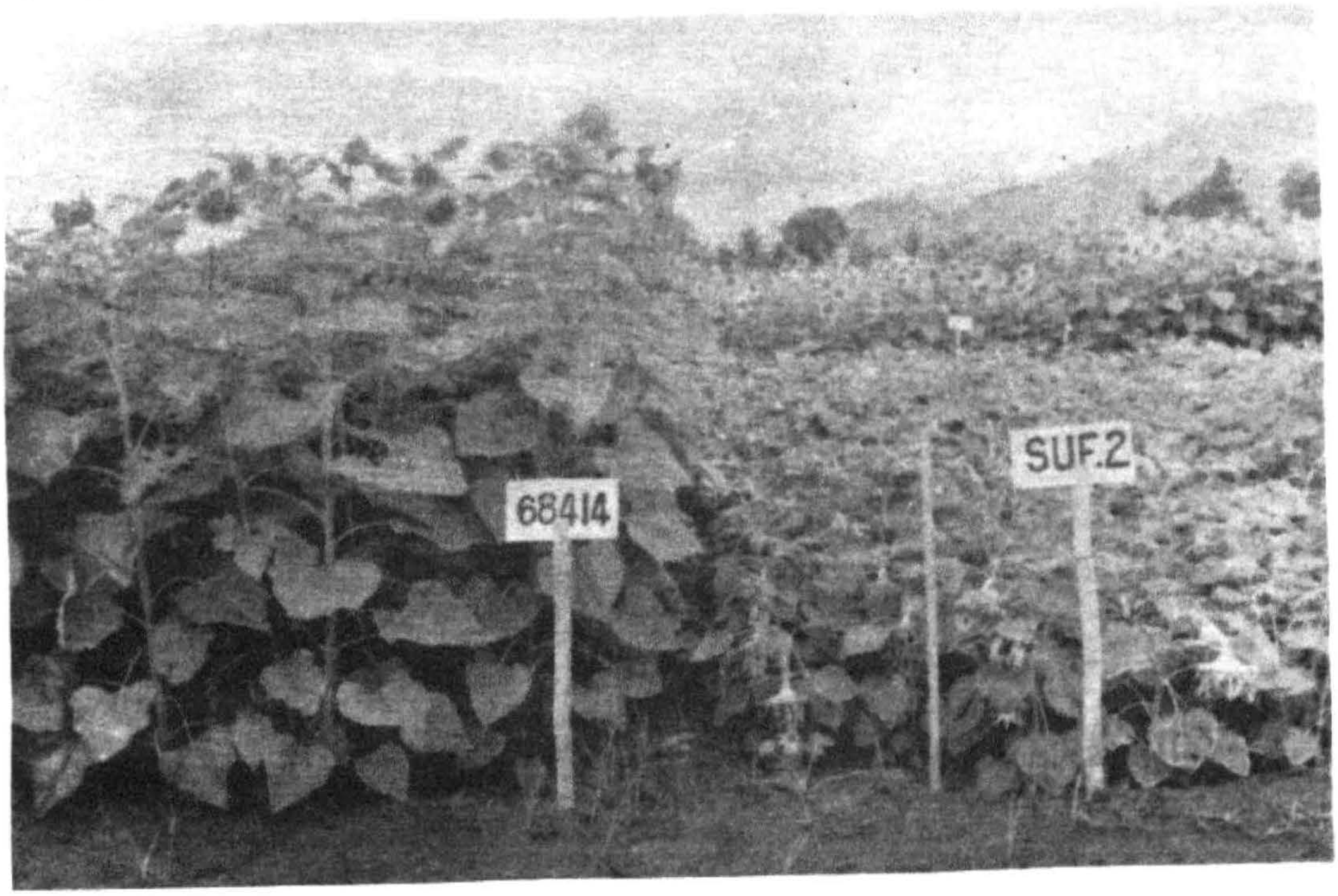
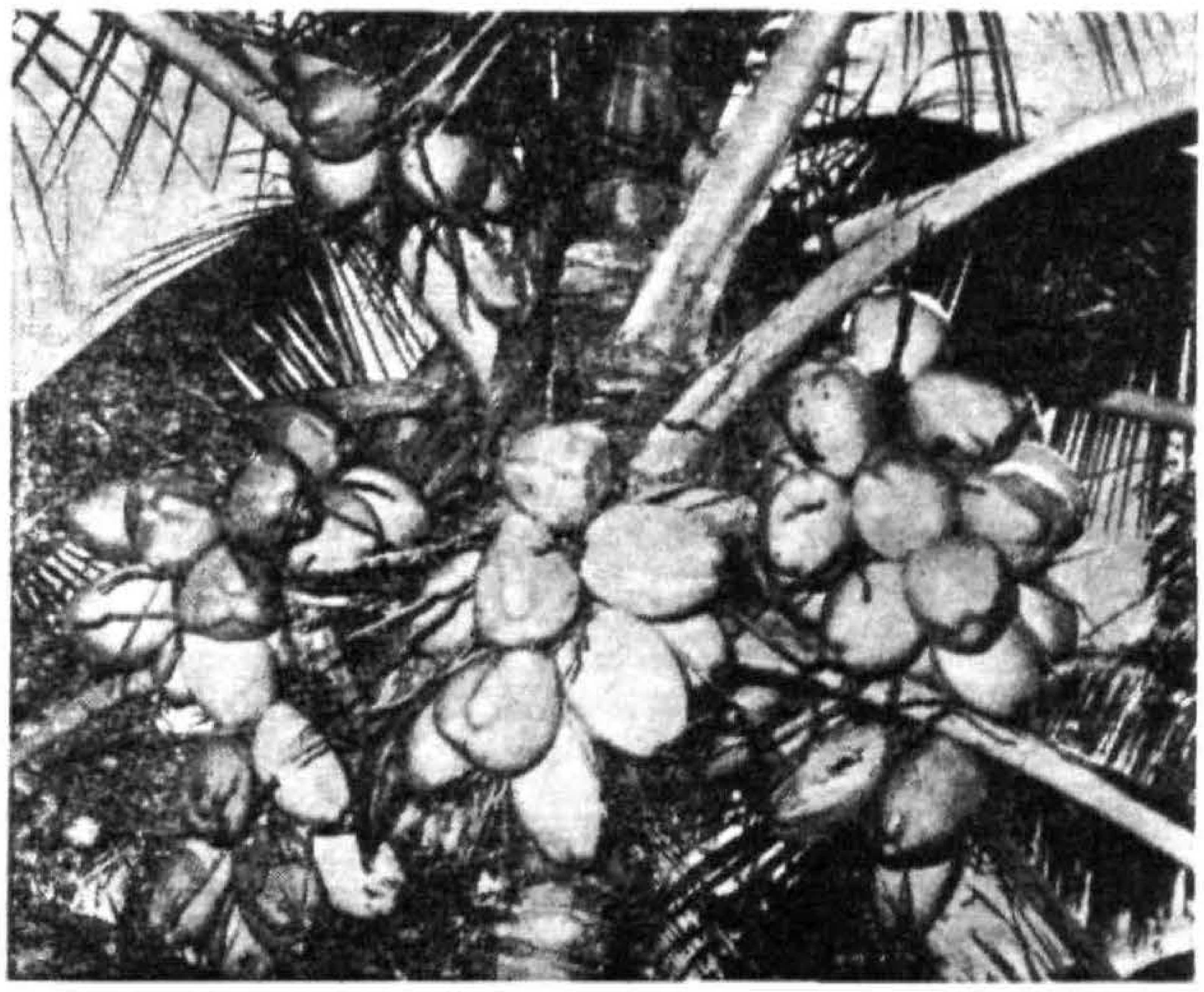


PLATE 17. HYBRID EAST COAST TALL X AYIRAMKACHI



PLALE 18. HYBRID EAST COAST TALL X DWARF GREEN

Strain K 1 with a duration of 85-90 days, is raised under rainfed (October to January) and irrigated (June to September) conditions and confined to the southern districts of Tamil Nadu. On the other hand, K 2 maturing in 65-70 days has been found to be suitable for cropping throughout the State.

A culture named SUF 2 (Plate 16) attaining a height of 80 cm and entailing a maturity period of 60 days has since been developed. Its yield potential is around 9q/ha. The mean per day productivity of grain in the rainfed crop of SU F 2 was 15.0 kg/ha as against 13.0 kg/ha for EC 68414. This dwarf selection lends itself better to be fitted into inter and multiple cropping systems. Its stability in performance is being assessed under adaptive research trials.

Coconut

Exploitation of hybrid vigour offers scope for improvement of yield of in nuts relatively short period. Several crosses were effected involving East-coast Tall on one hand and Ayiramkachi, Dwarf Green and Semi-tall Yellow on the other as parents. The yield data have shown the superiority of the hybrid East Coast Tall x Ayiramkachi (Plate 17) which recorded 110 nuts/palm/year accounting for 34.1 per cent increase over traditional East Coast Tall variety (82 nuts/palm/year). Next in order of yield (104 nuts / palm / year) is that of the hybrid, East Coast Tall x Dwarf Green (Plate 18) which is 26.8 per cent higher than that of the cultivated variety. (Table 65).

TABLE 65. Economic Trails of Hybrid coconuts and their parents

Particulars	East Coast	E. C. Tall x Ayiramkachi	Ayiram-kachi	E. C. Tall x Dwarf green	Dwarf green
Number of nuts/palm/annum	82	110	75	104	25
Number of nuts/ha	15416	20680	14100	19552	4700
Percentage of dehusked nut to whole nut	38.1	42.6	39.6	51.8	38.6
Yield of dehusked nuts kg/ha	6552	7135	3642	12995	1711
Percentage of kernel to dehusked nut	49.1	51.6	57.2	50.6	45.5
Yield of kernel kg/ha	3499	3681	2073	6687	780
Percent of copra to kernel	47.6	38.2	49.7	47.7	37.4
Yield of copra kg/ha	1666	1406	1033	3187	291
No. or nuts required to produce one tonne of copra	9253	14708	13689	6135	16129
Percent of tree with alternate bearing	30.0	87.7	100.9	68.3	60.0
Percent of trees which shed nuts	10.0	15.4	100.0	11.6	20.0

From the Table it could be seen that copra yield was higher in E C Tall x Dwarf green than in E C Tall x Ayiramkachi.

Resistance Breeding

Groundnut: Breeding improved varieties of oilseed crops possesing resistance to fungal and viral diseases has assumed much importance. The incidence of leaf spot and rust in groundnut is the major factor contributing to significant yield losses. Three selections PPG 2, PPG 3 and PPG 4 possessing resistance to rust were developed at Coimbatore from the FESR lines received from USA. These lines themselves were derived from a natural hybrid between the Virginia spreading groundnut PI 298115 and an unknown pollen donor. At Coimbatore, artificial hybridization of the bunch cultivars, TMV 7, TMV 9, AH 8188 and Co 1 was effected with the reselections of PPG 2, PPG 3 and PPG 4. The hybrids of the above matings were also involved in double and three-way crosses. Inter-specific hybrid derivatives involving *A. hypogaea* (TMV 7, TMV 9, OSN 2, POL 1 and Gangapuri) with *A. monticola* and *A. villosulicarpa* have also shown varying degrees of resistance to the above diseases. The accessions AH 35, AH 6677, AH 7043 and AH 7284 identified to be tolerant to the infection of ring mosaic were also crossed with *A. villosulicarpa* to incorporate the properties of high yield and resistance in the progenies. A wealth of segregating materials has been generated for manipulating variability and thereby achieve stable recombinants with the desired levels of productivity and resistance to diseases. Besides, two accessions of *A. hypogaea* (TG 14 and H 2-14) exhibiting tolerance to drought but low in productivity were mated with the improved groundnuts TMV 7, TMV 9 and Co.1 to isolate selections combining tolerance to drought, and improved level of productivity.

Gingelly : Powdery mildew is one of the serious diseases affecting this crop and efforts are being made to induce resistance into the cultivated varieties which are all susceptible. SI 1683, an extract of a cross between Karur local and a USA variety though low yielding, is found to possess a high level of field tolerance to powdery mildew. This derivative has been involved in multiple crosses with TMV 3. The advanced are generation progenies being evaluated.

Sunflower : Breeding sunflower varieties resistant to *Alternaria* and rust diseases is receiving attention. Two sets of crosses were effected, one involving the cultivars EC 68414 and EC 68415 with 18 varieties from germplasm indentified as field tolerant and the other with seven exotic lines. A composite population developed by intermating the progenies derived from the above sets of crosses exhibited field tolerance.

Soil Management

Gingelly

Response to application of micronutrients in gingelly: Attempts were made to increase the seed yield of gingelly through micronutrient fertilisation. An experiment was conducted with TMV 3 gingelly to which different micronutrients were applied, over and above the usual recommended dose of NPK fertiliser. Significant yield increase was obtained on account of Mn treatment either as soil application or foliar spray of $MnSO_4$ given thrice on 20th, 30th and 40th day when grown under irrigated condition. (Table 66).

TABLE 66. Effect of Manganese, Zinc, Iron and molybdenum on seed yield of TMV 3 gingelly

Nutrient	Methods of application*				
	Control	Soil application	Foliar	Seed soaking	Mean
Zn	6.15	9.92	8.24	7.17	7.87
Mn	6.23	11.98	10.98	8.23	9.30
Fe	6.18	8.78	7.56	6.99	7.37
Mo	6.17	9.96	8,31	7.54	7.99
Mean	6.18	10.16	8.72	7.48	8.14

	C. D.
Nutrient	0.95
Method of application	0.95
N x M	1.91

* Treatment particulars

	$ZnSO_4$	$MnSO_4$	$FeSO_4$	Na_2MoO_4
Soil application (kg/ha)	50 kg	25 kg	50 kg	0.5%
Foliar spray (Thrice for all micronutrients)	0.5%	1%	1%	0.05%
Seed soaking for 2 hours in micronutrient solution	2%	2%	2%	0.1%
Control	36 : 20 : 20 kg/ha of N; P_2O_5 and K_2O respectively			

CO 11 ragi grown after gingelly did not suffer from nutrient deficiency and the normal recommended dosage of fertiliser was quite adequate and the yield was compar able to those obtained at higher level of fertilisation. Hence the common belief that gingelly is an exhaustive crop and the subseqent crop suffers from nutrient deficiency is not borne by facts.

Crop Management

Groundnut

Crop-weed competition : The groundnut crop was kept weed-free from 2 to 10 weeks and compared with the unweeded population with regard to yield of pods. The yield increased progressively with an increase in the weed-free regime upto six weeks. Extending the weed free environment beyond six weeks had no contribution on yield. The loss in yield of produce due to weed growth was of the order of 24%. The first 40% of the growth period appeared to be critical from the stand point of crop-weed competition. Nearly 80% of the weed flora was constituted by grasses of which, *Echinochloa colonum* was predominant followed by *Dactyloctenium aegypticum.*

Effect of weather on yield : An investigation was carried out to assess the influence of weather on the bunch groundnut of POL 2 under irrigated culture. The experiments were conducted twice in each of the monsoon and summer seasons at the Agricultural Research Station, Bhavanisagar. The yield of pods was consistently high from the summer crop than from that of the monsoon, the increase being 27% This situation may be ascribed to factors like high temperature, high solar radiation, low relative humidity and low rainfall prevalent during the phase of pod development. The weather conditions during the monsoon season appear to be highly conducive for the spread of pests and diseases. Growing groundnut in the summer season at Bhavanisagar was advantageous for realising higher yield.

Sunflower

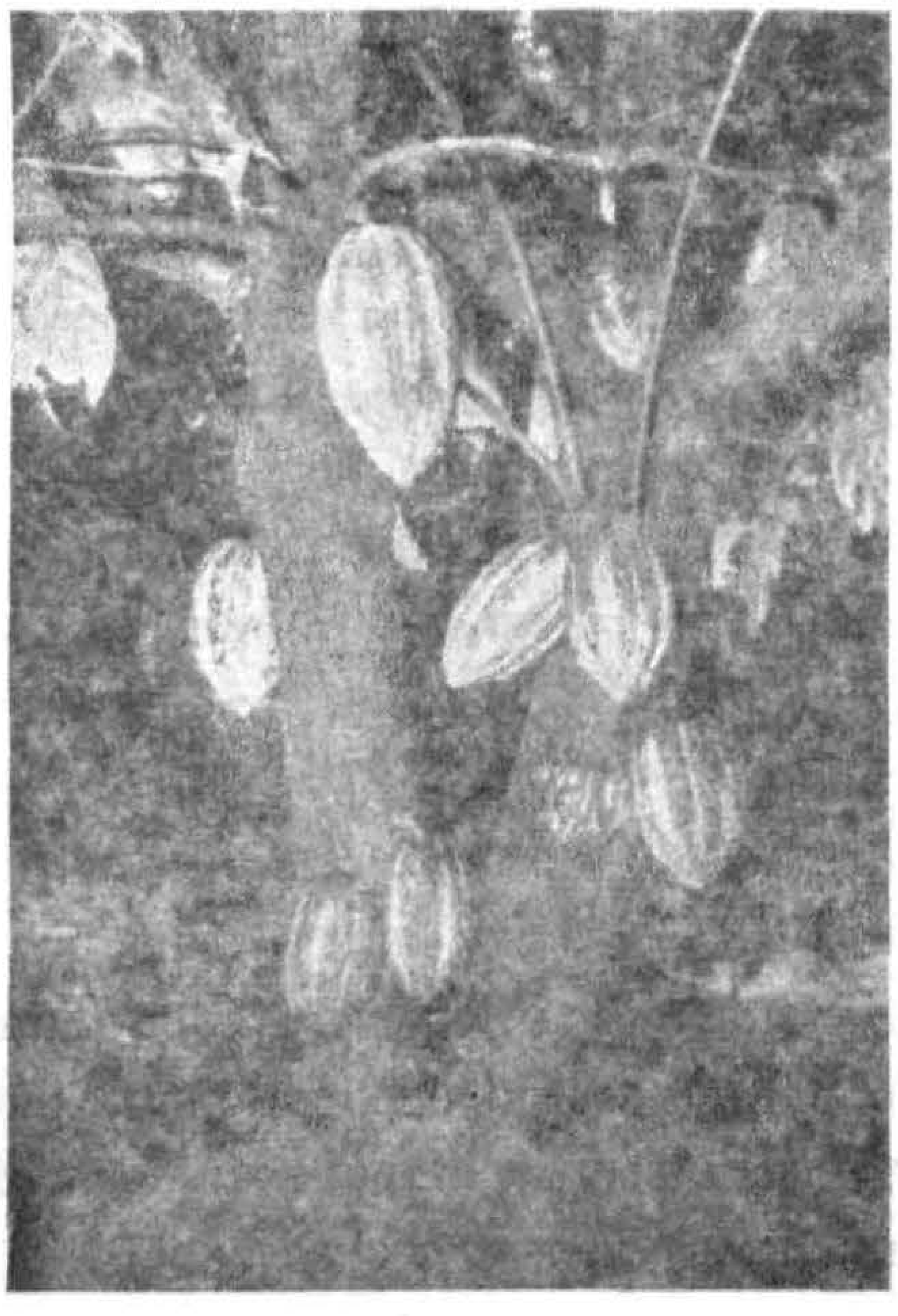
Crop - weed competition : The efficacy of two herbicides for the control of weeds in sunflower crop was tested. The application of Sirmate at 4.0 kg a. i. / ha facilitated the recovery of 1216 kg/ha of seeds, whereas with Lasso at 2.0 kg a. i. / ha, the yield was 1201 kg/ha. The yield of seeds from the untreated population was 716 kg/ha.

Mixed cropping : The mixed crop of blackgram and sunflower grown in 6:2 proportion gave the maximum monetary return in contrast to the benefit accruing from pure crops of either sunflower or jowar. A net income of Rs. 1944/ha was realised from the cropping of blackgram and sunflower together, the monetary gain from raising pure crops of sunflower and jowar being Rs. 1262/ha and Rs. 1239/ha respectively.

Coconut

Intercropping of Cocoa in Coconut : Two varieties of cocoa *viz.,* Criolo and Foresteiro could be successfully raised as intercrop in coconut. The criollo variety which started bearing in five years yielded 25 to 30 fruits / tree. The number of beans / fruit ranged from 15 to 32 with a mean of 25. The population of cocoa / ha was 250. One hundred kg of beans obtained on an average of 400 g/tree was valued at Rs. 3,800/- (at the rate of Rs. 38/- kg). The additional cost of cultivation due to raising of cocoa was Rs. 1400/-. Therefore, a net profit of Rs. 2400/ha could be realised by raising cocoa as an intercrop in coconut gardens. (Plate 19).

PLATE 19. Inter cropping of cocoa in coconut



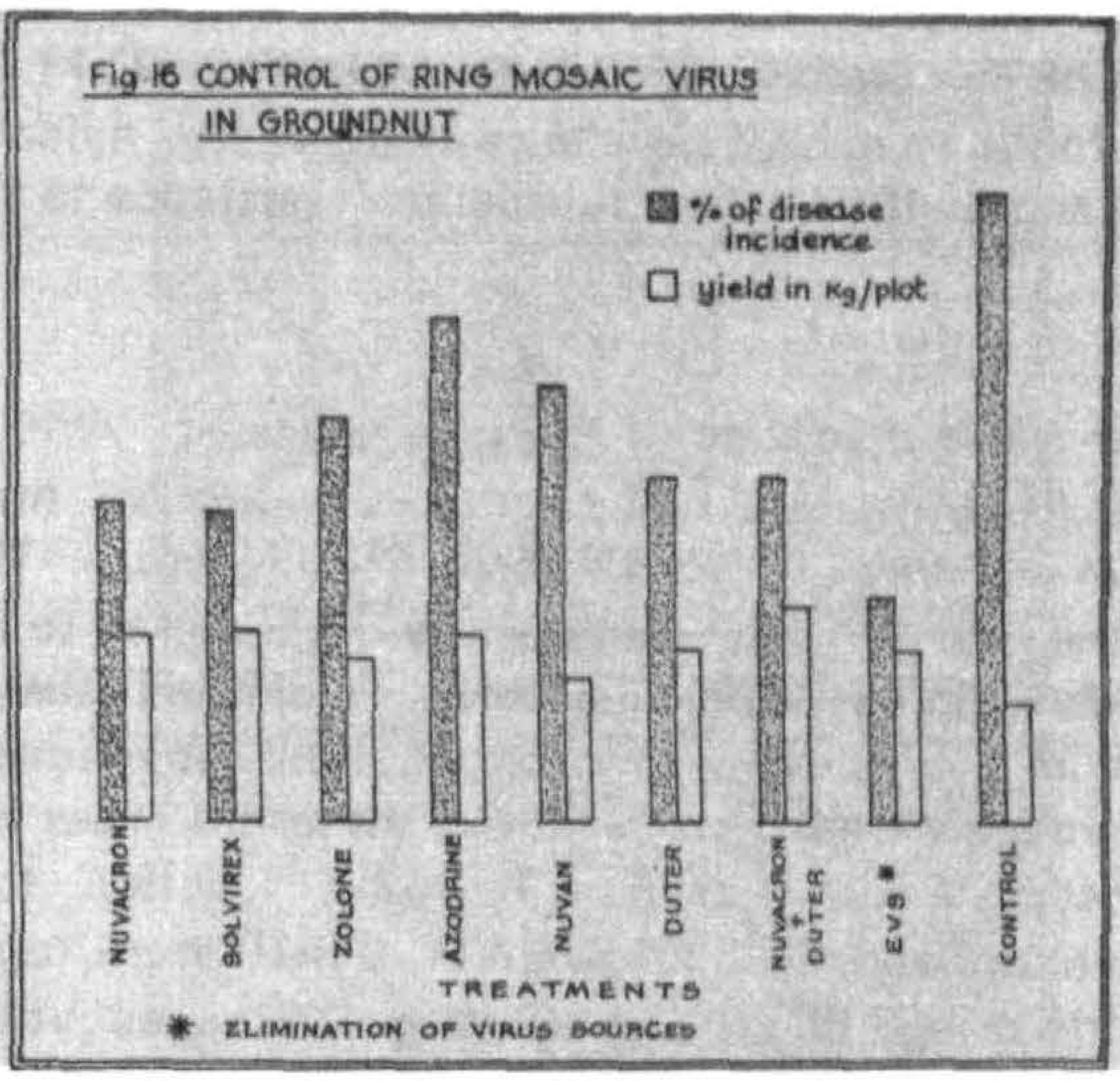
Crop Protection

Groundnut

Collar-rot disease : The relative efficacy of twelve fungicides viz , Agrosan, Organo mercurial seed dresser (OMSD), Ceresan, Thiram, Thiride, Captan, Baytan, Benlate, Bavistin, Sulphur dust, Dithane Z 78 and Dithane M 45 was assessed with regard to the control of this disease by treatment of seeds prior to sowing. The treatment with OMSD (0.2%) gave hundred percent control of the disease, and with Dithane M 45 (0.45%) and Benlate (0.2%), the order of reduction in disease incidence being 83.5 and 74.8 per cent respectively.

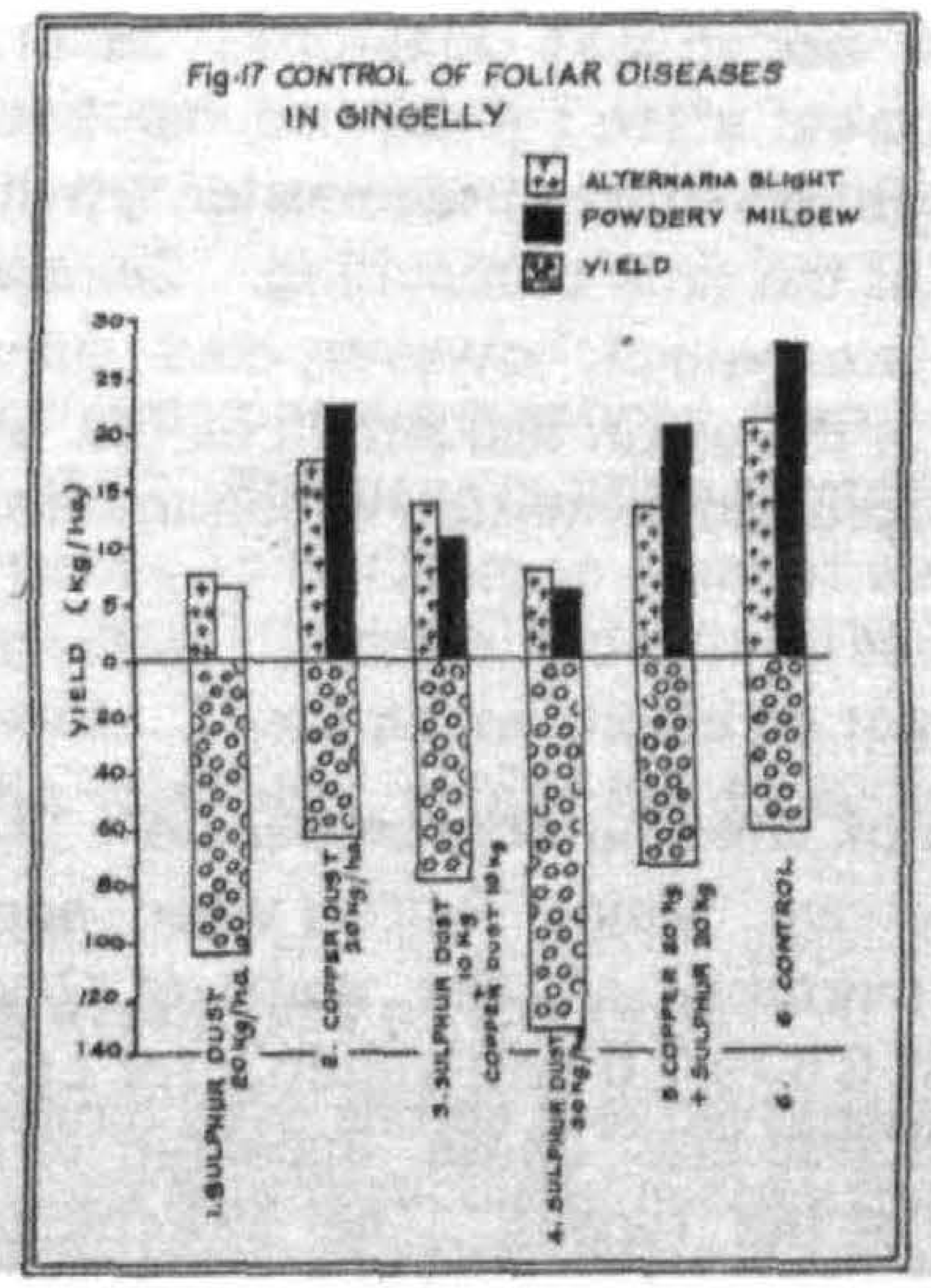
The trial on drenching of 17 day old groundnut plants with eight fungicides viz. Thiram, Thiride, Bavistin, Benlate, Dithane Z 78, Dithane M 45, Diflotan and Fytolan brought out their relative efficacy in controlling the infection. The reduction of infection was 55.9% following treatment with Thiram at a concentration of 4%. The increase in yield of pods was 79.6% in respect of Thiram, followed by Dithane Z. 78, Fytolan and Bavistin, the increase in yield being 43.4, 24.2 and 21.7% respectively.

Ring-mosaic disease : This disease is caused by the ring mosaic strain of tomato-spotted wilt virus. The hosts comprised cowpea, lablab, french bean, horsegram, broad bean, peas, tobacco, greengram and soybean. The virus was found to be antigenic, reacting positively with its antiserum upto a dilution of 1/32. Infected groundnut plants could be detected by phloroglucinol test and by the presence of intracellular inclusions in epidermal strips of infected leaves. As a result of screening the germplasm, six entries *viz.* AH 35, AH 6677, AH 7043, AH 7284, EX 1-1 and PV 1 were found to be tolerant, and the species, *A. glabrata* exhibited resistance. Adoption of a spacing of 15 x 15 cm and elimination of virus infected plants upto 45 days after sowing effectively reduced the disease incidence. Of the 18 different chemicals tested, application of Nuvacron (500 ml/ha) 30 days after sowing was effective in reducing the incidence of the disease and thereby contributing to increased yield. (Fig.16)



Gingelly

Powdery mildew and Leaf-blight diseases : The incidence of powdery mildew and *Alternaria* leaf - blight diseases of gingelly was effectively controlled by the application of sulphur dust at 20 kg/ha soon after the appearance of the disease symptoms. (Fig.17) Four varieties



among the 1040 screened (SI 1114, SI 1501, SI 1929 and SI 2979) were adjudged to be moderately resistant to *Alternaria* blight. The accession SI 1683 was found to exhibit resistance to powdery mildew whereas SI 1545, SI 1551 and SI 1962 showed mederate resistance to this disease.

Sunflower

Control of foliar diseases : The prevalence of *Alternaria* leaf-blight *(Alternaria helianthi)* and rust *(Puccinia helianthi)* on sunflower was revealed from a survey of foliar diseases in this crop. The loss in yield caused by the above two diseases was assessed to be 38.0 and 56.0% respectively. Epidemiological studies indicated that both the diseases occurred in a very severe form during May-November. But the summer crop is invariably free from the above diseases. Four hundred and ten sunflower accessions were screened for their reaction to the two diseases. Two cultivars viz., EC 89093 and EC 85820 were found to show tolerance to *Alternaria* leaf blight and rust diseases respectively. It was found that spraying the crop with Dithane M 45 or Dithane Z 78 (0.2%) on 35th day after sowing and another on 45th day was effective in controlling the diseases.

Castor

Control of semilooper : *Achoea janata* is a seasonal pest and occurs in a severe form during the months of November and December. The effect of Dimilin (diflubenzuron) was studied on the final instar larvae. The result of treatment became apparent after 3-4 days of injection of the chemical. Even the lowest dose of 50 ppm gave 96% mortality which occured either at the prepupal stage or at the time of moulting. Several larvae moulted to larval-pupal intermediates which, however, died subsequently. Dimilin is known to interfere with the chitin deposition in the endocuticle leading to the inhibition of glycoprotein formation which in turn promoted various types of deformities.

Coconut

Biological control of the Rhinoceros beetle : The fungal pathogen, *Metarhizium anisopliae* var. Major Tulloch when applied to farm yard manure effected 100% mortality of the grubs of *Oryctes rhinoceros.* Carrot broth with a pH of 6.5 to 7.0 was suitable for culturing the fungus. The fungal enzymes, chitinase and lipase appeared to play an important role in the pathogenicity of the fungus. The insecticides, hexachlorocyclohexane and carbaryl inhibited the germination thof the fungal spores.

PLATE 20. Thanjavur wilt of Coconut

Control of Thanjavur wilt of Coconut : Of the several diseases attacking coconut, Thanjavur wilt disease is the most important one causing considerable economic loss to the famers. (Plate. 20) In the field experiments, it was found that application of farm yard manure (200kg/palm/year) or neem cake (5 kg / palm / year) followed by irrigation of the palms regularly during summer months once in 10 days reduced the intensity of the disease.

Besides the above agronomic practices, drenching the root zone of the palms with 40 litres of 1% Bordeaux mixture combined with stem injection of 2 g of aureofungin-sol + 1g of $CuSo_4$ in 20ml of water is highly effective in controlling the disease. Disease index in treated palms is 15.97 as against 83.01 in control. These palms should be regularly irrigated during summer months. This treatment should be done thrice at an interval of three months.

Control of tapering stem wilt of Coconut :

Results of research have shown that the tapering stem wilt is associated with nutritional disorders particularly micronutrient deficiency, besides imbalance in organic matter and NPK and lack of soil moisture in summer

PLATE 21. Tapering stem wilt of Coconut

months. This disease is not caused by pathogens such as fungus, bacteria or virus. To restore the trees to normal bearing, micronutrients viz., borax, zinc sulphate, manganese sulphate, copper sulphate and ferrous sulphate each at the rate of 225g and ammonium molybdate at 10g should be dissolved in 20 litres of water and applied at the root zone of each tree. The micronutrient application should be superimposed over that of organic manure plus NPK followed by irrigation and this should be repeated for consecutive years. The yield increase in treated trees was from 6 to 9 nuts in the second year which further increased to 26 nuts in the third year. (Plate. 21).

Physiology

Groundnut : Evaluation of groundnut genotypes confirmed that pod weight is related to pod number, with a correlation of 0.988. However, in the semispreading variety Ah. 7456, high pod number resulted in less yield. Increased leaf area contributed to high productivity in the varieties Ah 7144, 14-A, Ah 12-2A and J 11. Moisture retention was found to be high in semispreading (Ah 7287 and Ah 7456) and spreading (TMV 4, and JH 60) types. An analysis of the shells, resulted in identifying two groups viz., low sodium with high potassium and high sodium with low potassium, the latter being suitable for cultivation in the saline areas.

A study of the relative water content (RWC) and prorein status indicated that each of the habit groups differed from one another; bunch with low protein and high RWC, semispreading with both low and high protein and high RWC and spreading with high protein-low RWC, low protein-high RWC and high protein-high RWC. This differential association enables the choice of appropriate varieties for exploitation.

Maximum levels of expression for harvest index, mature/immature pod ratio, peg/pod ratio and shelling percent existed in bunch cultivars. However, the semispreading varieties exhibited high levels of expression for dry matter production (DMP) per day and 100 kernel weight combined with drought tolerance. The semispreading varieties appear to be inferior in respect of the attributes specified above for the bunch and semispreading groundnuts. The semispreading groundnut varieties appear to offer much scope for genetic improvement of yield.

Biochemistry

Gingeily : Out of 1250 genotypes screened, the oil content was found to rage from 44.5 to 50.9 per cent. (SI 1878 TMV 2, SI 1551, TC 6 Til 1, T 58 and 9-7-7 and protein content from 37.5 to 41.8 per cent (9-7-7, T 58, and Til 1). Iodine value gave oscillating values from 102.3 to 119.5 (SH 97, SI 62, L 58, TC 26 and 9-7-7). Varieties given in parentheses, represent the higher range in values for the above attributes.

Microbiology

Mycorrhizal Isolates in groundnut soils : Six mycorrhizal isolates were drawn from six different "groundnut" soils and screened based on spore density, infection percentage and plant charactors, Similarly, an assesment of the respective mycorrhizosphere of roots of Co 1 groundnut grown in six different fields was made, to know the percentage of infecrion. One of the isolates (VAM-1) exhibited more spore density, percentage of infection,growth and nodulation. The VAM-1 has been tentatively indentified as *Glomus* sp.

PULSES

CONTENTS

Crop Improvement 94

- Redgram 94
- Blackgram 96
- Greengram 97
- Cowpea 101
- Bengalgram 105
- Horsegram 106
- Lab - lab 107
- Soybean 108
- Cluster beans 109

Resistance Breeding 109

Soil Management 110

- Effect of micronutrients
  - Greengram 110
  - Blackgram 11
  - Soybean 111
- Biological Nitrogen 112

Crop Management 113

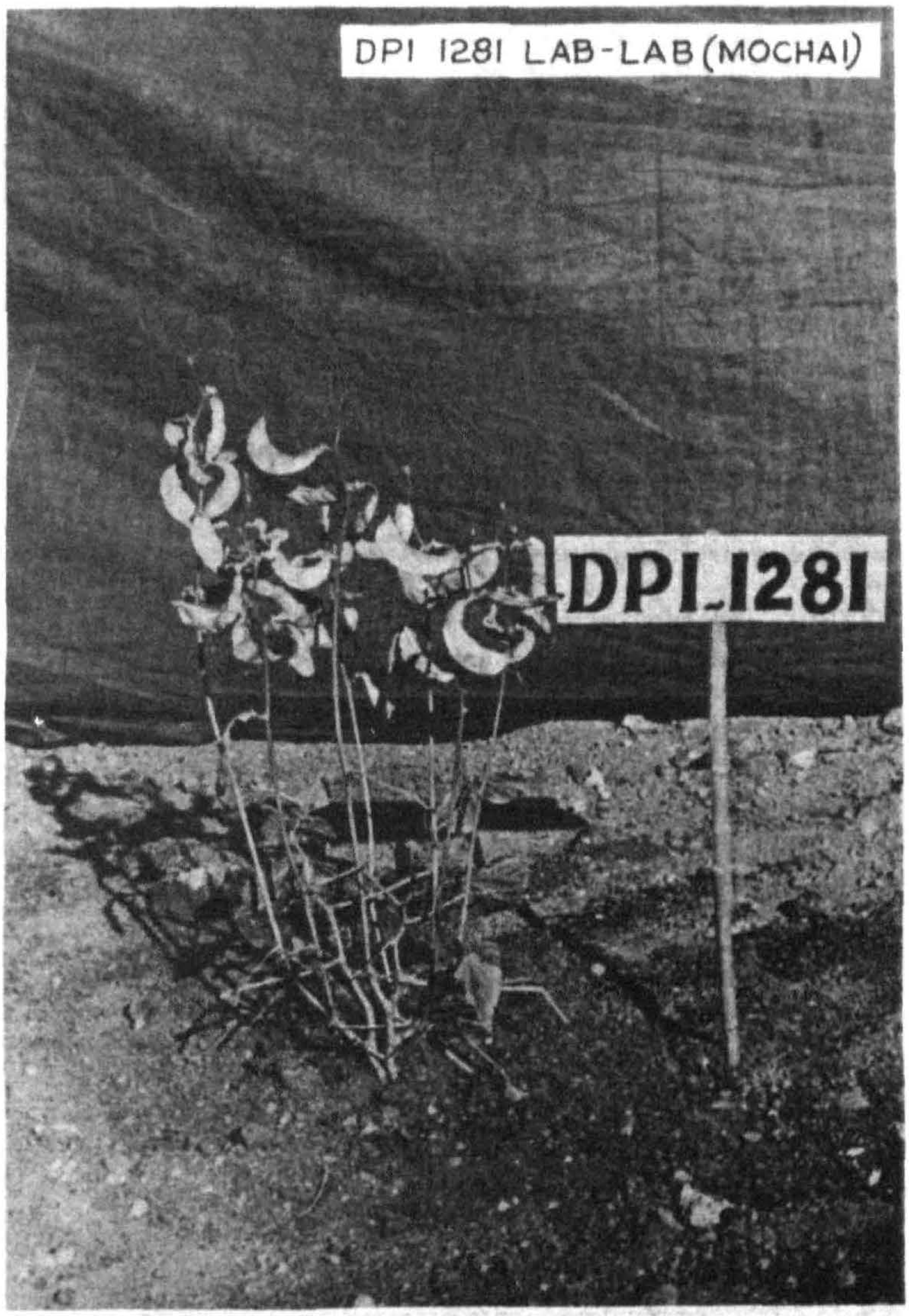
Crop Physiology 114

Crop Protection 116

- Management of Insects 116
  - Blackgram 116
  - Cowpea 116
- Management of Diseases 116
  - Bengalgram 117
  - Soybean 117

Seed Technology 117

- Blackgram 117
- Bengalgram 118
- Greengram 118
- Redgram 121


DPI 1281 LAB-LAB (MOCHAI)
DPI 1281

PULESES

Crop Improvement

In Tamil Nadu, pulses are grown in 11 lakh hectares accouting for 13 per cent of the total cropped area. The total annual production of pulses is three lakh tonnes as against the annual requirement of 12 lakh tonnes. The average yield of major pulses is low ranging from 250 to 550 kg per hectare. Pulses are mostly grown under rainfed conditions in marginal and submarginal lands as mixed crop with sorghum, bajra, groundnut, cotton and catch crop in rice fallows; they are also highly susceptible to insect pests and diseases. Dearth of high yielding stable varieties with photo insensitivity and earliness, and unsatisfactory post harvest technology are other major constraints limiting productivity of pulse crops. The concept of ideal plant type is also attempted in pulses to identify the ideotype that possesses greater photosynthetic efficiency and translocation of photo synthates to reproductive parts. In breeding programme of grain legumes, greater emphasis is also laid on resistance to major pests and diseases and stress conditions.

Redgram: Research efforts on crop improvement were intensified at Coimbatore, Vamban, Bhavanisagar and Paiyur. Screening was carried out to identify donors for high yield, earliness in duration, single stalked types, bold seed, male sterility, resistance to pests and diseases, particulary for pod borers, sterility mosaic, yellow mosaic, root rot, wilt, powdery mildew and also drought. Both at Coimbatore and Vamban, 30 lines have been identified for earliness. Of the 17 very early maturing (85-105 days) types obtained during 1980 from IARI, Delhi, two types have been observed to be promising for grain yield. (Table. 67)

TABLE: 67 Yield performance of promising short duration redgram types

Entry	Duration (days)	Grain yield (kg/ha
H 77-215	95	624
H 77-219	95	608
Prabhat	106	510

With the object of creating a wide range variability, 5640 crosses involving 93 cross combinations were effected and so far 224 crossed pods have been harvested. A total of 704 promising hybrid combinations in early generations and 106 promising cultures in advanced generations are being

evaluated for their yield potentiality. Thirty nine promising cultures received from ICRISAT are also under study.

A pureline selection, S 80 from the germplasm, when tested under different agro-climatic conditions over a period of six years was found superior to both Co 2 and Co 3. (Table. 68)

TABLE. 68 Yield performance of culture S 80

Culture	Duration (days)	Mean grain yield kg/ha	% increase over Co 3	% increase over Co 2
S 80	127	1138	24	61
Co 3	130	917	—	—
Co 2	120	706	—	—

In the early arhar coordinated trials conducted during *kharif* 1980. with16 entries, entry ICPL 87 was found superior to both Co 2 and Prabhat. (Tabla. 69)

TABLE. 69 Performance of early redgram entries in coordinated trials. Kharif 1980

No.	Entries	Origin	Duration (days)	Grain yield kg/ha	% over Prabhat
1.	ICPL 87	ICRISAT	104	785	66
2.	Pant A 10	Pantnagar	98	619	31
3.	ICPL 85	ICRISAT	93	597	27
4.	ICPL 1	ICRISAT	98	567	20
5.	Co 2	TNAU	123	479	...
6.	Prabhat	Kanpur	107	471	...

At Paiyur, an early maturing culture DPI 711 characterised by single stem, axillary clusters with as much as 80-90 pods/plant was found to outyield Co 3 and Prabhat consistently over three years. Single stemed nature of DPI 711 accommodated denser population per unit area and thereby facilitated higher yields. (Table. 70) (Plate. 22)

TABLE. 70 Yield performance of DPI 711 at Paiyur

Particulars	DPI 711	Co 3	Prabhat
Duration (days)	103	115	93
Yield (kg/ha)	1837	1090	865
per days production (kg/ha)	17.9	9.2	9.3

Under bund cropping. T 21 gave the highest yield of 54 kg/ha as compared to DPI 712 with 47 kg, DPI 705 with 46 kg and Co 2 with 33 kg.

Exploitation of male sterility : Out of the 760 plants studied in Ms 3A, Ms 4A, and ML 1 to 14, 96 plants were identified to be male sterile. Open pollinated as well as crossed pods were collected from these male sterile plants for further study.

Blackgram : Under source marerial, a total of 505 types at Coimbatore and 297 types at Vamban are being maintained for evaluation and use in hybridisation programme. Type U G 17 at Coimbatore and AC 214, Bithawa Black, Ramnad, VZM 189/22 at Vamban were fonnd very early maturing between 56 to 58 days. Type U 84 exhibited immunity to yellow mosaic virus at Coimbatore while at Vamban, U G 152, M 2 and B 12-4-4 were identified to be resistant types. G 31 at Coimbatore and Composite 1 at Vamban were the outstanding types identified for production of maximum number of pods per plant.

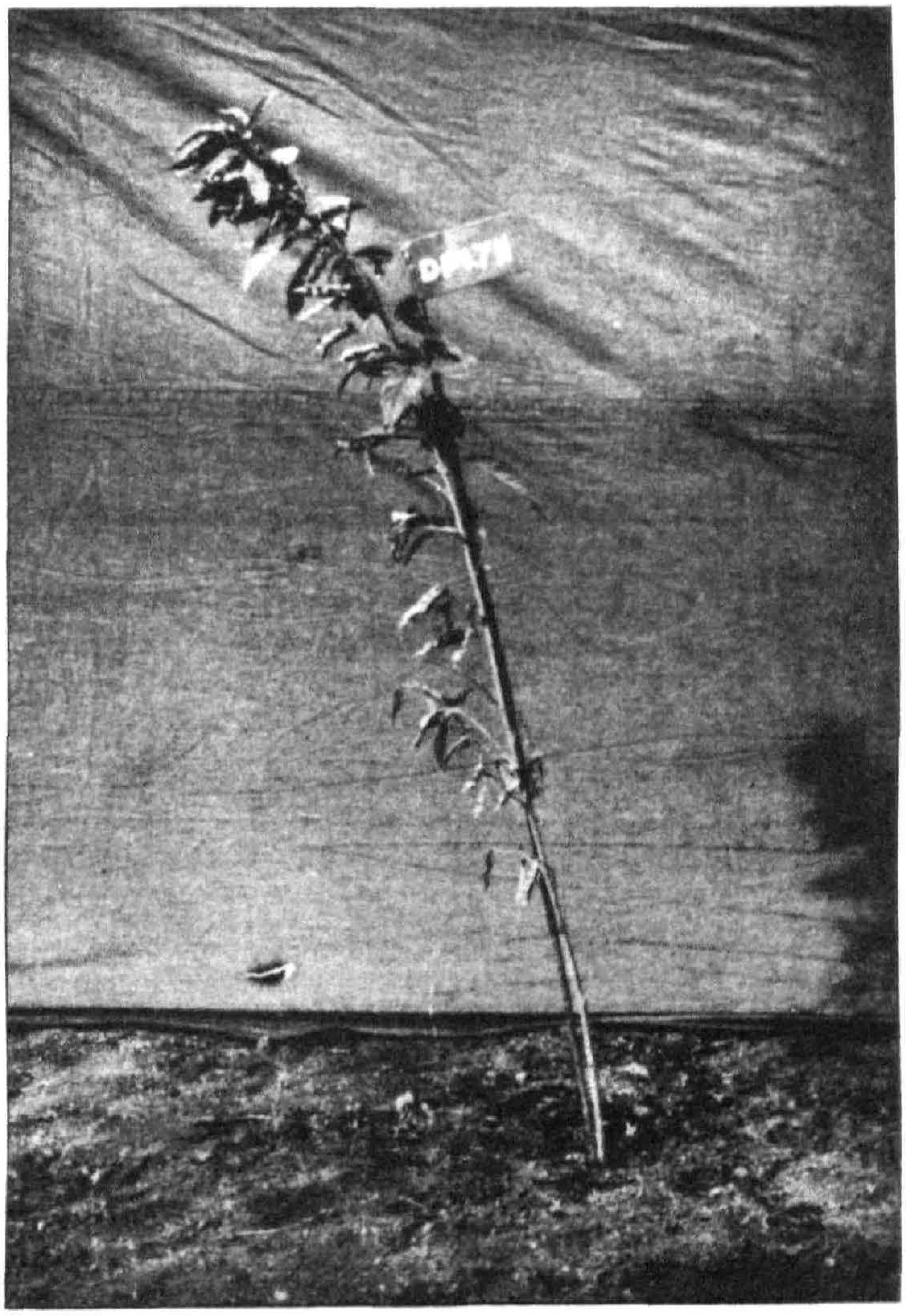
Among the 26 entries tested under rice fallows, entry Co BG 33 maturing in 75 days, recorded a grain yield of 1333 kg/ha as against 1276 kg with ADT 2. In the Comparative Yield Trials, three cultures *viz*., Co BG 5 (Mutant of H 21), Co BG14, Co BG 40 were found superior in yield over Co 3 (Table. 71)

TABLE. 71 Performance of blackgram cultures in Comparative Yield Trials

Culture	Duration (days)	Grain yield kg/ha	% increase over Co 3
Co BG 14	74	1060	37
Co BG 40	73	1050	35
Co BG 5	75	990	28
Co 3	80	776	...
CD (P=0.05)		159	

The culture BP 3, a pure line selection from Musiri local and characterised by compact habit and synchronous maturity, was tested in a large number of trials in the University research centres and farmers' holdings under varied agro-climatic conditions. Under rainfed conditions it recorded a mean grain yield of 746 kg per hectare as compared to 597 kg/ha for Co 4, the percentage increase in yield being 25 and 40 respectively over Co 3 and Co 4. Under rice fallows conditions, it recorded grain yield

Plate. 22 A SINGLE STEMED REDGRAM SELECTION
DPI 711 WITH PODS



of 931 kg/ha as against 715 kg and 710 kg/ha respectively, for ADT 2 and TMV1. It has been released as Co5 during1980 (Table.72) (Plate. 23)

Table. 72 Mean performance of CO 5 Blackgram (BP 3)

S.No.	Particulars	Grain yield kg/ha							
		Rainfed				Rice Fallows			
		No. of trials	BP 3 (Co 5)	Co 3	Co 4	No. of trials	BP 3 (Co 5)	ADT 2	TMV 1
1.	University Research Stations	9	794	603	660	2	931	715	710
2.	All India Coordinated trials	7	579	432	462	—	—	—	—
3.	Farmers' holdings (ART) and district trials)	38	766	609	—	—	—	—	—
4.	Overall mean	—	746	597	532	—	931	715	710
	Per cent increase over CO 3	—	25	—	—	—	—	—	—
	Per cent increase over Co 4	—	40	—	—	—	—	—	—
	Per cent increase over ADT 2	—	—	—	—	—	30	—	—
	Per cent increase over TMV 1	—	—	—	—	—	31	—	—
5.	Duration (days)	—	73	85	70	—	73	80	70
6.	Per day productivity	—	10	7	8	—	13	9	10

At Paiyur, in a trial to fix up blackgram varieties suitable for bund cropping, CO 4, DPI 704 and CO 2 respectively recorded 87, 85 and 82 kg/ha as against 60 kg/ha recorded by BNU 163-1.

At Krishi Vigyan Kendra, Pondicherry, Selection M 4, a mutant of CO 1 registered the highest yield of 1539 kg/ha accouting for an increase of 34 % over CO 4 which recorded only 1148 kg/ha.

Greengram : A study of 545 types in the germplasm revealed that type MDU 2007 combined superiority for number of grains/pod, pod length and 100 seed weight which are the important yield components. PLS 312 was the earliest to mature in 55 days. Seven high nodulation types (LM 370, LM 258, PLS 318/1, AC 42, MS 9331, NA 5 and PLS 351/2) were identified. Entry ML 65 was found to combine resistance to yellow mosaic virus, root rot, leaf crinkle and *Cercospora* leaf spot.

The different yield trials conducted during rabi, 1979, summer, 1980 and kharif, 1980, revealed the superior performance of Mutuant 2, an induced mutant of CO 1, maturing in 85 days. In the yield trial conducted during 1979 rabi, among the 21 entries drawn from all over India, Mutant 2

recorded the highest yield of 736 kg/ha as against 478 kg for CO 3 and 401 kg for KM 2. In another trial conducted during late rabi 1979 with 26 entries from IARI and Tamil Nadu, Mutant 2 recorded the highest yield of 862 kg as against 587 kg for KM 1 and 541 kg for CO 3. In the trials conducted in rice fallows, Mutant 2 recorded 592 kg of grain/ha as against 417 and 375 kg for KM 2 and CO 3 respectively. In the University Varietal Trial conducted during kharif, 80 Mutant 2 and MDU 3405 recorded 778 and 652 kg/ha respectively against 517, 515, 483, 476 and 391 kg/ha for KM 2, CO 3, KM 1, CO 2 and Vaikasi. (Table. 73).

Table. 73 Performance of Mutant 2 greengram in UVT during 1980 kharif season

Sl.No.	Entry	Source	Duration in days	Grain yield (kg/ha)	Per cent over Co 3	Per day productivity (kg/ha)
1.	Mutant 2	TNAU	83	778	51	9.4
2.	MDU 3405	Taiwan	62	652	27	10.5
3.	MDU 3404	,,	62	598	16	9.7
4.	MDU 2268	,,	62	578	12	9.3
5.	MDU 2010	,,	62	537	4	8.7
6.	MDU 1387	,,	61	530	3	8.7
7.	MDU 3096	,,	62	530	3	8.6
8.	KM 2	K. Malai	63	517	—	8.2
9.	CO 3	TNAU	70	515	—	7.4
10.	KM 1	,,	65	483	—	—
11.	CO 2	,,	65	476	—	—
12.	Vaikasi	,,	65	391	—	—
	C. D. (P=0.05)			133		

Per day production was higher in MDU 3405 than in Mutant 2 because of its earliness. In another varietal trial, Mutant 2 and culture 76-16 recorded grain yield of 709 and 685 kg/ha respectively as against 556 kg for KM 2. In per day productivity, culture 76-16 recorded 9.6 kg as against 8.3 and 8.4 kg/ha for Mutant 2 and KM 2 respectively. (Table. 74)

Plate 23 CO 5 BLACKGRAM (BP3)

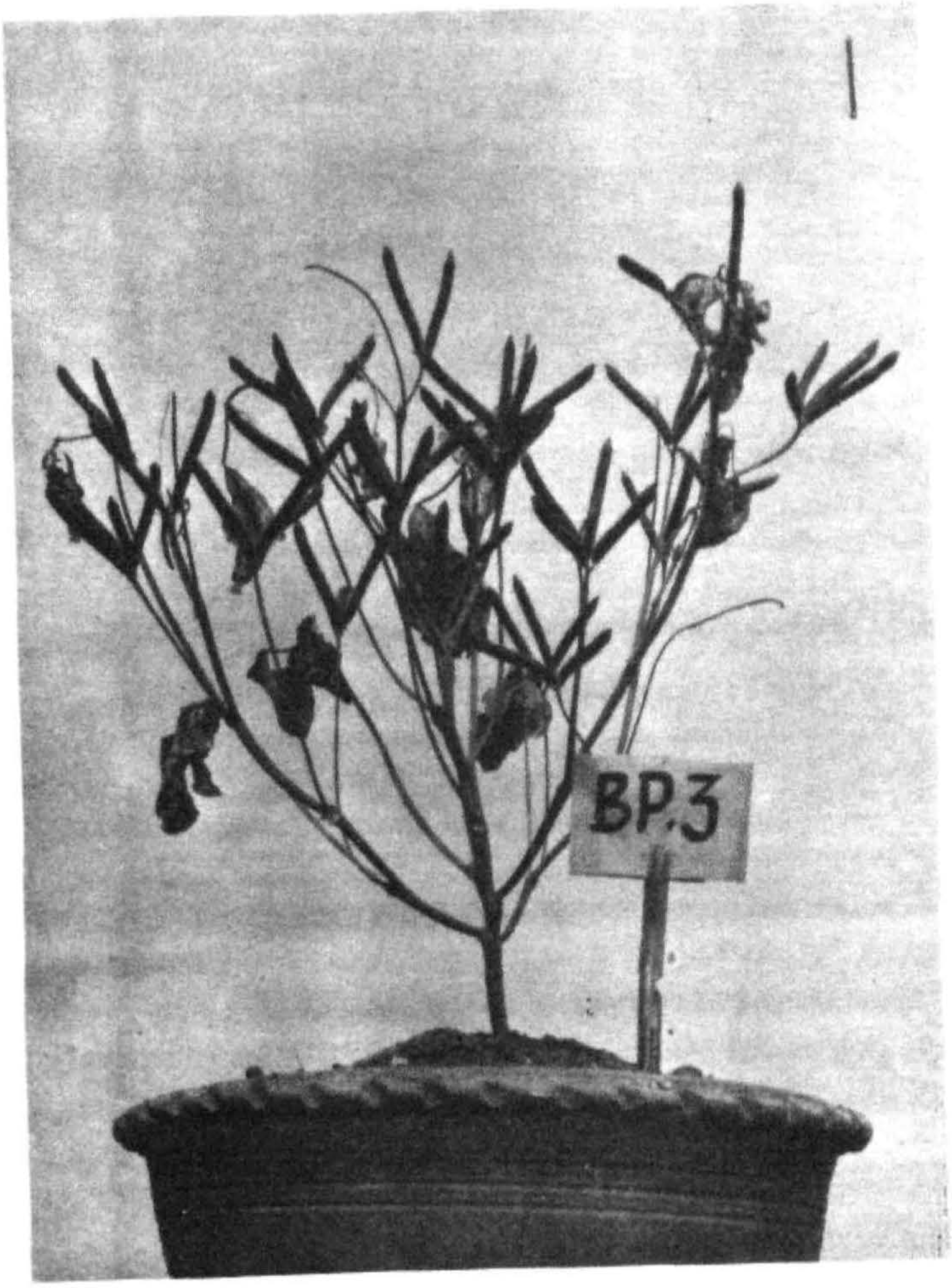


TABLE. 74 Performance of Mutant 2 in the Varietal Trial

Entry	Source	Duration in days	Grain yield (kg/ha)	% over Co 3	Per day productivity (kg/ha)
Mutatnt 2	TNAU	85	709	21	8.4
76 - 16	IARI	71	685	17	9.6
PIMS 4	,,	72	654	11	9.1
MC 33	Ludhiana	72	654	11	9.1
76 - 19	IARI	67	635	8	9.5
MC 30	Ludhiana	71	635	8	9.0
76 - 32	IARI	70	617	5	8.8
PIMS 3	,,	69	598	2	8.7
Co 3	TNAU	74	587	–	7.9
KM 2	K. Malai	66	556	–	8.4
CD (P = 0.05)			117		

Among the 24 entries tested during *kharif*, 1980, UPM 79-3-4 from Pantnagar maturing in 67 days gave the highest grain yield of 1323 kg/ha as against 1314, 1202, 1117 and 1114 kg for Mutant 2, ML 65, Co 3 and KM 1 respectively. In another trial conducted in the same season with 15 entires from IARI, entries S 4 and S 1 recorded 1rain yield of 1561 and 1525 kg/ha respectively as against 1494 kg for Mutant 2 and 1097 kg for Co 3.

The superior performance of Mutant 2 was also reported from Bhavanisagar where it recorded the highest yield of 1460 kg and 2346 kg during summer and kharif 1980 respectively. (Plate. 24)

Mutant 2, thus, when tested for the past six years under varied agro -climatic conditions in the state has shown its suitability for cultivation under rainfed, irrigated and rice fallows conditions. It recorded a mean grain yield of 828 kg as compared to 666 kg/ha for Co 3 under rainfed conditions, the percentage of increase in yield being 24. Under irigated cnnditions it recorded 1430 kg as against 1116 kg/ha for Co 3 accounting for 28 per cent increased yield. (Table. 75)

TABLE. 75 Mean Performance or Mutant 2 Greengram (rainfed)

Particulars	No. of trials	Yield (kg/ha) Mutant 2	Co 3	KM1	KM2	Vaikasi
Coimbatore campus	10	999	730	540	738	—
University Research Stations	11	719	605	—	—	—
All India Coordinated Trials	5	744	574	522	577	478
Adaptive Research Trials and Trials in farmers' holdings	65	857	753	537	528	491
Overall mean		828	666	533	614	485
Per cent on Co 3		24				
per cent on KM 1		155				
Per cent on KM 2		135				
Per cent on Vaikasi		171				
Duration (days)		85	75	65	65	65
Per day productivity		10	9	8	9	7

It was also found superior to other ruling varieties such as KM 2, S 8, Vaikasi, PS 7 and K 851. It has field resistance to tip blight, root rot and stemfly.

At Paiyur DPI 703 was found to be superior to Co 3 as could be seen in (Table 76) (Plate. 25)

TABLE. 76 Mean performance of DPI at Paiyur over 3 years (1977 - 80)

Particnlars	DPI 703	Co 3
Duration (days)	77	71
Yield (kg/ha)	1643	1245
Percentage of increase over control	32	—
Per day production (kg/ho)	21.2	17.5

Seed multiplication of DPI 703 is intensified for conducting multilocation trials. In bund cropping trial, DPI 703 recorded the highest yield of 55 kg/ha as against 50 kg for Co 3, 47 kg for Mutant 2 and 45 kg for DPI 701.

At Krishi Vigyan Kendra, Pondicherry, selection PIMS 1, a pureline from a variety received from Plant Introdnction Bureau, New Delhi, recorded a grain yield of 1214 kg as against 1180 kg/ha for Co 3. The increase n yield over Co 3 was 16 %.

Plate.24 MUTANT 2 GREENGRAM

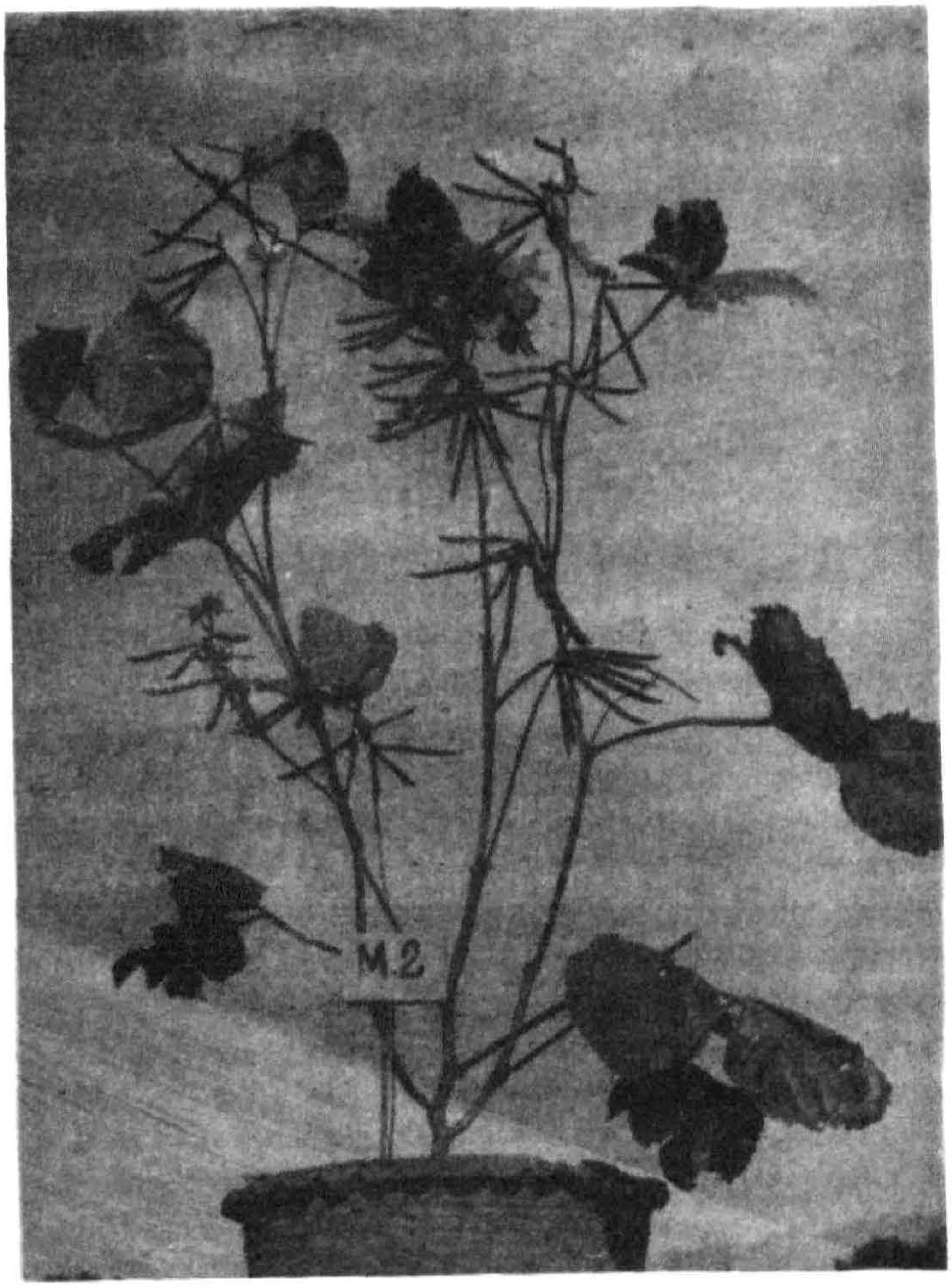


Plate 25 DPI 703 GREENGRAM

Cowpea: As source material, a total of 1445 genotypes are being maintained and evaluated for their characteristics in breeding.

With a view to generate new genetic variability to improve yield and quality and impart resistance to pests and diseases, 5099 crosses were effected employing the donor parents and Co 2, Co 3, RG 1 and Co 152 as base parents. In all, 465 pods were collected in 41 cross combinations. These are under study in F 1 generation. In F 2, 26 segregants involving 11 parents in 13 cross combinations showed promise.

From a population of 165 plants of the variety Lankaparuppu, 23 productive plants were selected for further exploitations. Under mutation breeding, when the varieties Co 1 and Co 3 were subjected to 0, 10, 20 and 30 krad gamma rays, the mortality percentage was found to be higher at the 30 krad level. A total of 216 plants studied in F_1 were advanced F_2.

Nine vegetable - cum - grain type entries were compared against Co 2 in a replicated trail during kharif 1980.

The entry RG 1, a selection from germplasm maturing in 75-80 days recorded 16 quintals of green pods per hectare closely followed by C419 with 15.9 quintals as against 10.8 quintals for Co 2 (Table 77).

TABLE 77. Performance of Vegetables-cum-grains types in Cowpea

Entry	Source	Duration in days	Gross pod yield (kg/ha)	Grain yield (Kg/ha)	Increase over Co 2
RG - 1	TNAU	85	1600	968	20
C 419	Tamil Nadu	90	1592	840	4
Mangalore Local Chockolet	Mangalore	91	1504	904	12
Co 2	TNAU	85	1075	805	—
Mangalore Local Onion	Mangalore	91	848	544	—
S 288	Karnataka	78	815	461	—
Panathadi	Kerala	95	605	381	—
EC 455	Phillipines	90	493	333	—
Udipi Long Pod	Karnataka	95	349	221	—
Panathadi Long Pod	Kerala	94	277	179	—

The mean grain yield of RG 1, for summer and kharif 1980 was 9.1 quintals per ha as against 7.6 quintals for Co 2.

The quality assesment based on organoliptic test and consumers preferece conducted by the Department of Food Technology revealed that Udipi long, Panathadi long, RG 1, S 288 and Co 2 were the best.

In an yield trial conducted during kharif, 1980 with sixteen entires including Co 2 and Co 3 under partial irrigation, PTB 1 maturing in 78 days recorded the highest grain yield of 1225 kg as against 731 kg, 542 kg and 532 kg respectively for Co 3, KM 1 and Co 2. (Table 78).

TABLE 78 Mean performance of Grain type of cowpea in University Variety Trial (irrigated)

Entry	Sourse	Duration in days	Grain yield (kg/ha)	Per cent increase over Co 3
PTB 1	Kerala	64	1225	67.5
COPUSA 3	IARI	67	1069	46
VI 6	,,	66	992	36
V 38	,,	64	980	34
26 - 4 - 1	,,	64	939	27
C 52	Tamil Nadu	65	917	25
V 37	IARI	64	881	21
TMV 410	,,	64	819	12
CO 3	TNAU	65	731	–
KM 1	Tamil Nadu	60	542	–
CO 2	TNAU	65	532	–
CD :			165	

Under rainfed conditions, too, PTB 1 recorded the highest yield of 1005 kg/ha as against 732 and 475 kg for Co 3 and KM 1 respectively. (Table 79).

TABLE 79. Mean performance of Grain Types of Cowpea in University Variety Trials (rainfed)

Entry	Source	Duration (days)	Grain yield (kg/ha)	Percent increase over Co 3
PTB 1	Kerala	71	1005	37
COPUSA 2	IARI	79	914	25
COPUSA 1	,,	76	908	24
COPUSA 3	,,	74	849	16
C 152	Tamil Nadu	82	848	16
FG 1	TNAU	80	838	14
VICTOR 2	ZAMBIA	79	791	8
TVU 408	IARI	76	765	5
CO 2	TNAU	80	743	2
CO 3	,,	80	732	—
V 37	IARI	76	598	—
V 16	,,	76	504	—
KM 1	Tamil Nadu	62	475	—
TVU 410	IARI	76	356	—
V 38	,,	75	339	—
26 - 4 - 1	,,	74	367	—
CD (P = 0.05)			275	

In the All India Co-ordinated Varietal Trial / conducted during kharif, 1980 with 20entries, 9 recorded significantly higher yield than Co 3. Of these S 488 maturing in 65 days has given the highest yield of 1073 kg closely followed by KM 1, V 240, U 317 and V 46 with 1037, 933, 923 and 912 kg/ha respectively as against 662 kg for Co 3. (Table 80).

TABLE 80. Mean performance of Cowpea Grain types in Co-ordinated Varietal Trials

Entry	Source	Duration (days)	Grain yield kg/ha	Per cent Increased over Co 3
S 488	Karnataka	62	1073	62
KM 1	Tamil Nadu	56	1037	57
V 240	IARI	66	933	41
V 317	,,	67	923	39
V 26	,,	66	912	38
V 87	,,	67	885	34
CG 7	Gundanpin	66	860	30
V 59	IARI	67	854	29
RG 1	TNAU	67	840	27
CO 3	,,	67	662	—
CO 2	,,	68	660	—
CD (P = 0.05)			176	

(Performance of the remaining nine entries are poorer and not furnished).

At Vamban, in the All India Co-ordinated Varietal Trial with 16 entries including C 152, twelve entries recorded significantly higher yield of grain per hectare than C 152. Entries V 317, closely followed by RC 25 were the highest yielders. (Table 81).

TABLE 81. Yield performance of Cowpea under All India Co-ordinated Trials at Vamban

Entry	*Source*	*Duration* (days)	*Grain yield* kg/ha	% increase over C 152
V 317	IARI	64	682	91
RC 25	Rajasthan	63	658	84
V 26	IARI	67	581	63
HG 22	Hissar	63	573	62
S 488	Karnataka	17	539	51
V 240	IARI	72	531	49
CG 28	Gurdaspur	72	521	46
CG 7	Gurdaspur	71	518	45
V 87	IARI	67	473	32
V 16	IARI	70	458	28
V 59	IARI	67	435	22
C 152	IARI	68	357	...
CD ($p = 0.05$)			38	

At Paiyur, under rainfed conditions DPI 1243 was found to be superior to C 152. (Table 82).

TABLE 82. Performance of DPI 1243 and C 152 under rainfed conditions at Paiyur

Entry	Duration (days)	Mean grain yield (kg/ha)	Per day production (kg/ha)	Pod lengths (cm)	No. of seeds/ Pod	100 seed weight (g)
DPI 1243	89	2085	23.4	15.6	13.2	11
C 152	84	1551	18.5	14.9	13.4	10

DPI 1243 has a compact plant type with dark green foliage, bold and brick red seeds and long pods. It is moderately tolerant to yellow leaf mosaic virus disease. (Plate 26).

Among the different pulses (Cowpea, blackgram, greengram, redgram and lab lab) tried for bund cropping at Paiyur, Cowpea performed better

Plate: 26 DPI-1243, COWPEA SELECTION

than others. The type K 1473 recorded 91kg of grain yield/ha in comparison to 83 kg for CM 16, 76 kg for Co 3 and 73 kg for C 152.

Bengalgram : 532 types of Bengalgram from germplasm collections were examined for traits such as earliness, resistance to pests and diseases.

Out of 217 progenies in 58 cross combinations studied in early generations, a total of 5072 single plants were selected in the field for futher exploitation. Under mutation breeding, 17 and 14 gamma irradiated M 5 mutant selections from Chaffa and Radhey respectively were evaluated. From these three, Chaffa 60 kr-521 (1-14), Chaffa 80 kr-4-1 (1-12) and Radhey 100 kr 5-1 (1-4) have been advanced for further exploitation.

In the yield trials conducted during rabi, 1979, under rainfed and irrigated conditions, the response of 22 entries differed. Under rainfed conditions entries ICC 4, Annegiri, Phule G 2, ICC 1 and ICC 13 recorded 1248, 1188, 1181, 1165 and 1146 kg grain per hectare respectively as against 955 kg for Co 2 (Table 83).

TABLE 83. Mean yield performance of Bengalgram under University varietal trials (rainfed), Coimbatore

Entry	Source	Duration (days)	Grain yield (kg/ha)	Per cent increase over Co 2
ICCC 4	ICRISAT	96	1248	31
Annagiri	Karnataka	81	1188	24
Phule G 2	Rahuri	79	1181	24
ICCC 1	ICRISAT	82	1165	22
ICCC 13	ICRISAT	84	1146	20
Co 2	TNAU	85	955	...
CD			160	

Under protective irrigation, Phule G 3 recorded the highest yield of 1555 kg/ha as against 1402 kg for Co 2. Its performance under rainfed conditions was on par with Co 2.

In the Initial Evaluation Trial, conducted with 36 entries, twentyfive entries were significantly better in yield ranging from 568 to 844 kg/ha. Entry GNG 15 has recorded 844 kg/ha as against 422 kg for Co 2.

In the All India Coordinated Varietal Trial during rabi, 1979,9 entries gave higher yield than Co 1 and Co 2. Among these, RAU 54, Phule G 3, Phule G 2 and ICCC4 recorded 833, 804, 790 and 779 kg/ha respectively as compared to Co 1 and Co 2 yielding 718 and 703 kg/ha. The yield differences between entries, however, were not significant (Table 84).

TABLE 84. Yield performance of Bengalgram in Coordinated Varietal Trials at Coimbatoreduring rabi, 1979

ENTRIES	SOURCE	Duration (days)	Grain yield kg/ha	Per cent increase over Co 2
RAU 54	Bihar	97	833	19
PHULE G3	Rahuri	76	804	14
PHULE G2	Rahuri	76	790	12
ICCC 4	ICRISAT	97	779	11
PHULE G1	Rahuri	76	757	8
ICCC 13	ICRISAT	88	743	6
BG 220	IARI	97	737	5
ANNAGIRI	Karanataka	87	728	4
PHULE G 4	Rahuri	76	728	3
Co 1	Tamil Nadu	87	718	2
Co 2	TNAU	86	703	—

Horsegram

Among the 282 types studied in the germplasm stock during 1979 rabi, HPK 1 was observed to be the earliest to mature in 90 days and IC 8599, the most productive one (5.8 g per plant)

Twenty four single plants in six cross coimbinations were advanced to F2 for further study. From out of 66 progenies, 33 were found superior to Co 1 which were selected for further study.

In the Kulthi Coordinated Trials conducted during 1979 rabi, among the 11 entries tested, entries JND (Gujrat) and PDP 1 (Andhra Pradesh) maturing in 98 and 103 days recorded 799 and 683 kg of grain yield per hectare as against 259 kg/ha for Co 1 (105 days) registering 43 and 22 per cent increased yield respectively over Co 1. (Table 85).

TABLE 85. Mean performance of Horsegram in Co-ordinated Varietal Trial, Coimbatore during rabi, 1979.

ENTRY	SOURCE	Duration (days)	Grain yield kg/ha	Per cent increase over Co1
JND 1	GUJARAT	98	799	43
PDP 1	Andhra Pradesh	103	683	22
CO 1	Tamil Nadu	105	559	—
PLS 9	TNAU	103	547	—
BGM 1	Karnataka	109	429	—
VZM 1	Andhra Pradesh	103	417	—
HPK 6	Himachal Pradesh	93	182	—
HPK 2	Karnataka	93	125	—
HPK 4	Himachal Pradesh	93	101	—
HPK 5	Himachal Pradesh	93	98	—
HPK 2	Himachal Pradesh	93	96	—
CD :			111	

At Vamban, too, JND 1 recorded the highest grain yield of 1012 kg/ha followed by HPK 5 with 981 kg/ha as against 825 kg/ha for Co 1.

Lab lab

The gene pool comprise 58 pandal Avarai (*Lab lab niger* var *typicus*) and 663 Mochai types.

In a trial involving Mutant 1, Mutant 2, Mutant 3 and 4 against Co 6, Co 7, Co 8 and Co 9 conducted during Kharif, 1979, summer 1980, Kharif 1980, Mutant 3 (gamma irradiated mutant of Co 6) recorded 7209 kg of green pods per hectare as against 6677 kg for Co 9 and 6556 kg for Co 8. All are of same duration (120 days) (Table 86).

TABLE 86. Mean performance of Mutant 3 Lab-lab

SNC Entries	Duration (days)	Green Pod yield kg/ha			
		1979 Kharif	1980 summer	1980 Kharif	Mean
Mutant 1	120	4669	6050	4959	5226
Mutant 2	120	2616	3390	4711	3272
Mutant 3	120	6251	8100	7276	7209
Mutant 4	120	4954	7420	4335	5236
Co 6	120	3720	4820	5717	4752
Co 7	120	5068	5270	4399	4579
Co 8	120	5818	7540	6310	6556
Co 9	120	6174	8000	5856	6677

At Paiyur, five short duration early, compact plant type, photoinsensitive, suitable for both summer and winter seasons with a duration of 80-85 days were identified and designated as DPI 1279, DPI 1280, DPI 1281, DPI 1282 and DPI 1283.

Soybean : An evaluation of 616 types of Soybean in germplasm revealed that there are 7 types (Co 1, KM 1, KHS b 2, IC 2061, EC 36956, Bragg and Hill) with high yield, 8 types (UGM 22, PK 359, UGM 21, PK 75-303, EC 39374, *UPSM 19, UGM 28, IC 2061*) with early maturity, 2 types (Co 1 and KHSb 1) with good germinability, 4 types (JS 2, UGM 23, J 197-N 49 and EC 3904) with bold seed, 2 types (UGM 25, J 197 - N 49) with less beany flavour and one type (UPSM 19) with resistance to bacterial blight and yellow mosic. These are being utilised in hybridisation programme. The type UPSM 19 combines earliness and resistance to bacterial and yellow mosaic.

A total of 14,905 crosses in 119 cross combinations were effected during 1980 summer and Kharif season and 1322 pods in 102 combinations were collected. In F_1, a total of 451 plants in 72 crosses were studied and 143 plants in 47 crosses were selected and advanced to F_2. A population of 4239 plants was studied in 66 progenies from 34 combinations and one or two plants in 19 cross combinations found desirable, were selected for further study in F_3.

A population of 4980 plants in 249 progenies comprising of 38 crosses were studied and 10 plants outstanding in 4 crosses were selected and advanced to Replicated Row Yield Trails.

Among the four short duration culture under trial, PK 75 - 303 from Pantnagar was found better than the others followed by UGM 21, a selection from Taiwan variety. (Table 87).

Table 87. Yield performance of short duration Soybean cultures

Culture No.	Source	Duration (days)	Grain yield (kg/ha)	Per day prodn. (kg/ha)
UGM 21	Selection from Taiwan variety	68	1349	19.9
UGM 22	UGM 21 x PK 359	69	1158	16.8
UGM 28	Co 1 x UPSM 19	71	1216	17.1
PK 75 - 303	Pantnagar	72	1650	22.9

Two hundred and three entries were tested in yield trails during 1980 in difrerent seasons and the following six entries were found to be promising for yield when compared to Co1. (Table 88).

TABLE 88. Performance of Soybean entries for high yields

S.No.	Entry	Source	Duration (days)	Grain yield (kg/ha)	% increase over Co.1	Per day production (kg/ha)
1.	JS 442	Babalpur	89	3201	29	36.0
2.	PK 396	Pantnagar	79	3117	26	39.5
3.	PK 75 - 299	-do-	89	3114	25	35.0
4.	IC 2061	Kalimpong	78	2881	16	36.9
5.	KHSb 2	Karnataka	97	2507	1	25.9
6.	Co 1	TNAU	85	2484	—	29.2

It could be seen that JS 442, PK 396 and PK 75-299 are outstanding with yield increase of more than 20 per cent over Co 1.

Under mutation breeding, UGM 21 and Co 1 were subjected to che-, mical (EMS) and Physical (gamma rays) mutagen at different doses (0, 10 20 and 30 krads in gamma rays and 0.002, 0.003, 0.004 mM EMS) and in combination and studied in F_1 during 1980 kharif. A total of 150 mutan plants were advanced for further study in F_2.

Cluster Beans : The mean performance of seventeen types of cluster beans studied over two seasons to asses their yield potential in comparision to that of the Kolathur local (standard) revealed that all the seventeen types yielded better than the standard. The type HFG 23 with a duration of 110 days recorded a mean yield of 2495 kg/ha as against 984 kg/ha for the standard with a duration of 125 days. Other high yielding types are ILO 2391 with 105 days (2147 kg/ha), Durgapura Ajoy with 105 days (2162 kg), Pusa Sona with 105 days (2246 kg), Type 2384 with 110 days (2210 kg), and Pusa Naubahar with 110 days (2214 kg).

Resistance Breeding in Pulses Crop

Pulses are prone to attack by pests and diseases because of their high nutritive value and amylose content. The use of chemicals in the control of pests causes problem of environmental pollution hazards to living beings, pests getting tolerance to chemicals besides causing resur-

gence problems. Apart from this, increasing cost of chemicals and maintenance of equipments also pose problems to the farmers. Therefore, research exphasis on resistance breeding was also given due importance.

Some of the achievements made in this direction are :

Redgram	Co 2 tolerant to wilt and root rot and Co 3 Resistant to root rot, tolerant to wilt and pod borer.
Blackgram	Co 3 less susceptible to root rot tolerant to thrips, pod borers and stemfly, Co 4 tolerant to leaf crinkle, tip blight and powdery mildew, less susceptible to stemfly and pod borers and Co 5 moderately resistant to powdery mildew, leaf crinkle, pod borer and resistant to yellow mosaic.
Greengram	Co 2 tolerant to yellow mosaic, Co 3 tolerant to thrips and pod borers, less susceptible to root rot and moderately resistant to yellow mosaic and Mutant 2 resistant to root rot, stemfly and tip blight.
Cowpea	Co 3 tolerant to die back and mosaic.
Bengalgram	Co 2 resistant to wilt and phyllody under fieldconditions.
Lab lab	Co 9 tolerant to wilt, root rot and leaf spot diseases under field conditions tolerant to leaf aphids.
Soybean	Co 1 resistant to yellow mosaic, stemfly and pod borer.

Soil Management

Effect of micronutrients in yield of greengram : Field experiment conducted at Aliyarnagar on the effect of micronutrients in yield of greengram revealed that among the different micronutrients applied both to soil and foliage, the seed yield of Co 3 greegram was substantially increased due to the soil application of 25 kg $Znso_4$/ha. (26 per cent over NPK treated control). (Table 89).

TABLE 89. Response of greengram (Co 3) to the application of micronutrients

Treatments	Seed yield (kg/ha)	
	Yield	increase % over control
Control (NPK alone)	673	—
0.25 kg/ha sodium molybdate	680	+ 1
25 kg/ha Zinc sulphate	846	+ 26
50 kg/ha zinc sulphate	787	+ 17
12 . 5 kg/ha copper sulphate	641	− 5
100 kg/ha ferrous sulphate	661	− 2
50 kg/ha manganous sulphate	566	− 16
Foliar spray thrice 0.5 per cent zinc sulphate	615	− 9
Foliar spray thrice 0.5 per cent copper sulphate	591	− 12
Foliar spray thrice 1 per cent ferrous sulpate	606	− 10
Foliar spray thrice 1 per cent manganous sulphate	678	+ 1
Foliar spray thrice 0.1 per cent sodium molybdate	727	+ 9
C. D. (p = 0.05)	75	

Micronutrients for increased yield of blackgram : Application of 25 kg ferrous sulphate per hectare increased the yield of blackgram by 25 per cent besides increasing nitrogen fixatation by 15 per cent over control in red sandy loam soil of Palathurai series which is slightly calcareous. The soil is rated as low in available iron content. Ferrous sulphate was basally applied to the soil. Nitrogen at 25 kg N/ha and P at 50 kg P_2O_5 were applied to the soil. The number and weight of root nodules were increased by about 37 and 32 per cent respectively, due to application of ferrous sulphate.

Effect of micronutrients on soybean : Earlier studies have indicated that soybean is responsive to manganese application. However, the performance of different varieties to the application of micronutrients by different methods superimposed over NPK is not known. To provide information on this aspect, an experiment was conducted in pot culture with different varieties of soybean and the following were the results.

Substantial yield increases for different varieties of soybean viz. Co1, UGM 21, M-2, M-3, 27/8, Punjab-1, D-S 74-40 and Davis were achieved due to soil application of $Mnso_4$ at 50 kg/ha. The next best treatment was foliar spray of 1 per cent $Mnso_4$ thrice during the crop growth at 20th, 30th and 40th day after sowing. On the basis of per cent increase in seed yield, the varieties could be rated in the descending order as follows.

Co 1, 27/8, UGM 21, Punjab 1, DS 74-40, M3 Davis M-2.

Thus Co 1 can be considered as the most responsive for Mn treatment either as soil application or foliar spray treatment. (Table 90).

TABLE 90. Effect of Mn, Zn and Mo treatments on seed yield of soybean (Mean of three replications in g/pot)

Treatments	Varieties								Mean
	Co 4	27/8	M-2	M-3	UGM 21	Punjab	D. S. 74-40	Davis	
T_1 control NPK + FYM	3.39	3.93	4.74	4.54	4.80	3.85	4.16	4.52	4.24
T_2 $MnSO_4$ 25 kg/ha	5.67	5.77	5.88	6.00	6.79	4.94	5.36	5.92	5.79
T_3 $MnSO_4$ 50 kg/ha	5.91	5.96	5.97	6.40	6.97	5.54	5.89	6.25	6.11
T_4 $MnSO_4$ (F. S.) foliar (1%) spray	5.90	6.08	5.93	6.34	6.95	5.68	5.57	6.24	6.09
T_5 $MnSO_4$ seed soaking	4.79	5.03	5.11	5.10	5.38	5.04	4.88	5.08	5.05
T_6 0.5% $ZnSO_4$ spray	5.55	5.36	5.47	5.76	5.90	5.58	5.44	5.51	5.57
T_7 0.1% Na_2MoO_4 spray	5.61	5.41	5.45	5.72	5.89	5.51	5.15	5.49	5.57
Mean	5.26	5.36	5.51	5.70	6.10	5.16	5.26	5.57	

Testing for	S. E.	C.D.
T	0.044	0.13
V	0.047	0.14
T x V	0.122	0.35

F. S. Foliar spray of 1 per cent $MnSO_4$ solution thrice duricg the crop growth on 20th, 30th and 40th day after sowing.

Biological nitrogen fixation: In blackgram, multistrain treatment gave 591 kg and 532 kg for Co 4 and T 9 registering 20 and 8 per cent increased yield respectively over the control.

In greengram, the multistrain inoculation on Co 3 and Ps 16 recorded a grain yield of 628 kg and 601 kg/ha respectively with an increase of 32 and 26 per cent over the control.

In cowpea, Co 3 showed greater response than Russian Giant for the Multi-strain culture with grain yield of 725 and 700 kg per ha respectively recording an yield increase of 16 and 11 per cent over the control. Among the cultures, Multistrain was more effective than others.

In Bengalgram, among the four varieties tested, Co 1 showed the maximum respose to Multistrain treatment with grain yield of 786 kg/ha. (41% increased yield over control).

In another experiment to study the performance of multistrain rhizobial inoculant in comparison to composite and the control at farmers, holding under irrigated and rainfed conditions, the results revealed that under irrigated conditions KM 2 greengram and C 152 cowpea responded better than the T 9 blackgram. Under rainfed conditions the effect of multistrain was markedly lower and greengram responded better than either blackgram or cowpea (Table 91).

TABLE 91. Performance of multistrain rhizobial inoculants on yield of pulses

Crop/Variety	Treatment	Grain yield			
		Irrigated		Rainfed	
		Kg/ha	% increase over control	Kg/ha	% increase over control
Blackgram T 9	T1	477	12.7	643	3.5
	T2	457	9.3	643	3.5
	T3	414	—	621	—
Greengram KM 2	T1	536	9.1	544	10.8
	T2	469	13.0	539	7.8
	T3	415	—	500	—
Cowpea C 152	T1	725	22.9	451	4.1
	T2	704	19.3	445	2.7
	T3	590	—	433	—

T1 : Multi-strain T2 : Composite culture T3 : Control

Crop Management

A study of response of three early redgram varieties (105-19-2, 112-11-1 and S 14) to six population densities (2.66, 1.77, 1.33, 1.60, 1.06 and 0.80 lakh plants per hectare and three nutrient levels (0, 25-50-0 and 30-75-0 kg of NPK per hectare) was conducted under irrigated conditions during 1980 kharif. The yield dlfferences due to variety, plant density and their interaction were significant. Among the varieties 112-11-1 and S 14 were found to be on par and superior to 105-19-2. Variety 112-11-1 recorded the highest grain yield of 1616 kg/ha followed by S 14 and 105-19-2 with 1513 and 555 kg respectively. Among the six spacings, 1.77 lakh plants/ha recorded the highest yield of 1500 kg/ha and was on par with 1.66 lakh plants/ha and significantly superior to other plant densities. In all the six spacings, variety 112-11-1 (1610 kg/ha) and S 14 (1513 kg/ha) were on par and significantly superior to 105-19-0 (555 kg/ha) in grain yield. Among the three nutrient levels, 30-75-0 kg NPK/ha gave the higeest grain yield of 1392 kg/ha and was found to be superior to other two levels (Table 92 and 93).

TABLE 92. Response of a few early Redgram genotypes to population densities (Irrigated)

Spacings (cm)		Grain yield kg/ha			
		Varieties			Mean SE : 185 CD : 253
		U1: 105-19-2	U2: 112-11-1	U3: S 14	
S_1	25 x 15	492	1512	1277	1093
S_2	37.5 x 15	621	1992	1887	1500
S_3	50 x 15	492	1407	1397	1097
S_4	25 x 25	664	1800	1712	1392
S_5	37.5 x 25	537	1337	1292	1056
S_6	50 x 25	522	1610	1513	1215
	Mean	555	1610	1513	
	SE : 60				
	CD : 179				

for means in the body of the Table SE : 147
CD : 438

TABLE 93. Response of a few early Redgram genotypes to NPK nutrients (Irrigated)

	Particulars			Grain yield kg/ha
	N	P	K kg/ha	
F_1	0	0	0	1047
F_2	20	50	0	1237
F_3	30	75	0	1392
SE :				26
CD (P=0.05)				75

Crop Physiology

Productivity in pulses was sought to be enhanced by means of foliar sprays of growth regulators at Coimbatore. Ethrel was uniformly helpful to all the grain legumes - redgram, greengram and blackgram. The concentration and time of spray differed. Besides grain yield, other attributes were influenced. Data are presented in Table 94.

TABLE 94. Effect of Ethrel on grain yield and other associated characteristics

Pulses and Treatments	Grain yield/ plant g.	Increase in yield over control(%)	100 grain weight g.	Pod length cm.	Pods/ plant No.	Pod set (%)	Protein (%)
Redgram							
Control	7.92	—	9.255	4.62	65	48.4	25.1
Ethrel 100 ppm (70 and 90 days)	9.10	15	8.820	4.47	76	59.4	27.7
Greengram							
Control	2.88	—	3.407	6.25	15	46.4	24.7
Ethrel 150 ppm (35 and 45 days)	3.64	26	3.699	6.66	21	53.7	26.6
Blackgram							
Control	2.96	—	4.512	4.43	14	58.3	25.0
Ethrel 250 ppm (40 and 55 days)	3.27	10	4.668	4.37	14	60.6	24.4

Ethrel improved the yield of redgram by 15, greengram by 26 and blackgram by 10%. The effect is seen in terms of per cent pod set as well as 100 grain weight in all the pulse crops. However, the effect is varied in pod length and protein status of the grain legumes. The number of pods per plant increased appreciably in greengram and to a less extent in redgram.

In the pot culture studies conducted at Madurai on the prevention of flower drop in redgram, the fertility was increased by 91% with NAA 20 ppm when used as a spray at flower initiation stage. Significant increases in flower production of Co 3 (67.6%) was obtained with water spray. In the field trial, the increase in fertility coefficient over the control was the highest in the treatment receiving NAA 20 ppm. The same treatment recorded the highest growth yield, the increase over the control being 42%. Thus the foliar spray of NAA 20 ppm at flower initiation stage observed to increase the fertility co-efficient and grain yield.

Field studies conducted at Madurai on 21 types of greengram, 9 of blackgram and 7 of redgram were carried out to asses the photosynthetic efficiency in these pluses. In greengram, Co 3 revealed its superiority with regard to pod weight, grain number, grain weight and total plant dry weight. In blackgram, Co 3 was superior to others in leaf area, total plant dry weight and pod characters. In redgram Co 2 proved superior with regard to total plant dry weight, number of pods, pod weights, number of

grains and grain weight. The studies on drought tolerance is carried out at Madurai with 11 cultures of blackgram, 21 of greengram and 7 of redgram adopting techniques like D. Mannitol test, relative turgidity test and wilting studies, both in pot culture and field trails, indicated that Co 4 blackgram and Pant A 3 redgram showed greater tolerance to drought.

Crop Protection

Management of Insect Pests

Blackgram

Out of 54 accessions screened for their resistance to pod borer and stemfly infestation under unprotected conditions, Pant U 19 was the most resistant to the stemfly with 2.9% infestation.

Cowpea

A total of 259 accessions was screened for resistance to aphid infestation under unprotected conditions. None of the accessions exhibited immunity. The accession P 1476 was resistant and exhibited antibiosis effect. It had the highest number of hairs in the abaxial surface, Another important observation was that aphid fed on the susceptible type MS 8988 had shorter nymphal duration, higher fecundity and increased adult longevity.

Management of Diseases

Blackgram

Under storage conditions, blackgram seed harbour fungi which affected the root developement later when sown. All the fungi (*Helminthosporium* sp., *Asperillus* sp. ,*Pestalotius* sp., *Rhizobus* sp., and *Fusarium* sp.) studied affected the root development of the seedlings significantly. For the control of storage fungi, blackgram seeds were treated wite different fungicides and the seeds were sown at monthly intervals for 7 months and their yield assessed. Among the fungicides, Thiram and Captan treatmests prevented seed deterioration in storage as could be seen in Table 95.

Table 95. Yield (g) of grains per plant raised from seeds stored for different periods

Treatment	1 month	3 months	5 months	7 months
Thiram	32	35	38	36
Captan	33	31	32	34
Untreated control	32	33	27	21
CD	NS	NS	4	3

Bengalgram

In an experiment conducted with five fungicides, alone or in combination, for the control of root rot, fungicidal treatment, in general, significantly increased the percentage of germination and emergence of seedlings with 90.7 for Difolaton to 97.6 for PCNB + Thiram as against 84.3 for the control. It significantly reduced the incidenceof root rot (except in the case of Difolaton 25.8 %) with 2.4% for PCNB + Thiram to 18.5% for Captan as against 25.5% for the control. Combination of PCNB and Thiram was the most effective recording the highest yield of 928 kg/ha as against 560 kg/ha for the control.

Seven greengram varieties (Co 1, Co 2, Co 3, KM 1, KM 2, Mutant 2 and 652/4) were screened under artificial inoculation for resistance to root rot and tip blight. The varieties KM 2 and Mutant 2 were found to be moderately resistant to these two diseases.

Soybean

A mosaic disease occuring on soybean was caused by a virus and transmitted by sap and aphids viz., *Aqhide gossypi*, *A. craccivora* and *Myzus persicae*. The virus had a dilution point between 1 : 1000 and 1 : 2000, thermal inactivation point between 60° and 65C° and longivity *invitro* upto 4 days at 7 - 10°C. *Phaseolus vulgaris* and *Glycine weight* acted as symptomless carriers for this virus. Soybeen types JN 2750, UGM 23 and UGM 24 were free from the disease in the field. The virus was identified as a strain Soya virus 1.

Seed Technology

Blackgram

Studies on seed development and maturation in Co 2 blackgram indicated that pod development reached maximum on the 25th day of

anthesis. Seeds also attained physiological maturity on 25th day, when their moisture content, germination and weight were 10.94 per cent, 93 per cent and 197.33 mg, respectively. Hence, for obtaining seed with high viability and vigour the crop should be harvested 25 days after 50 per cent flowering (Fig. 18).

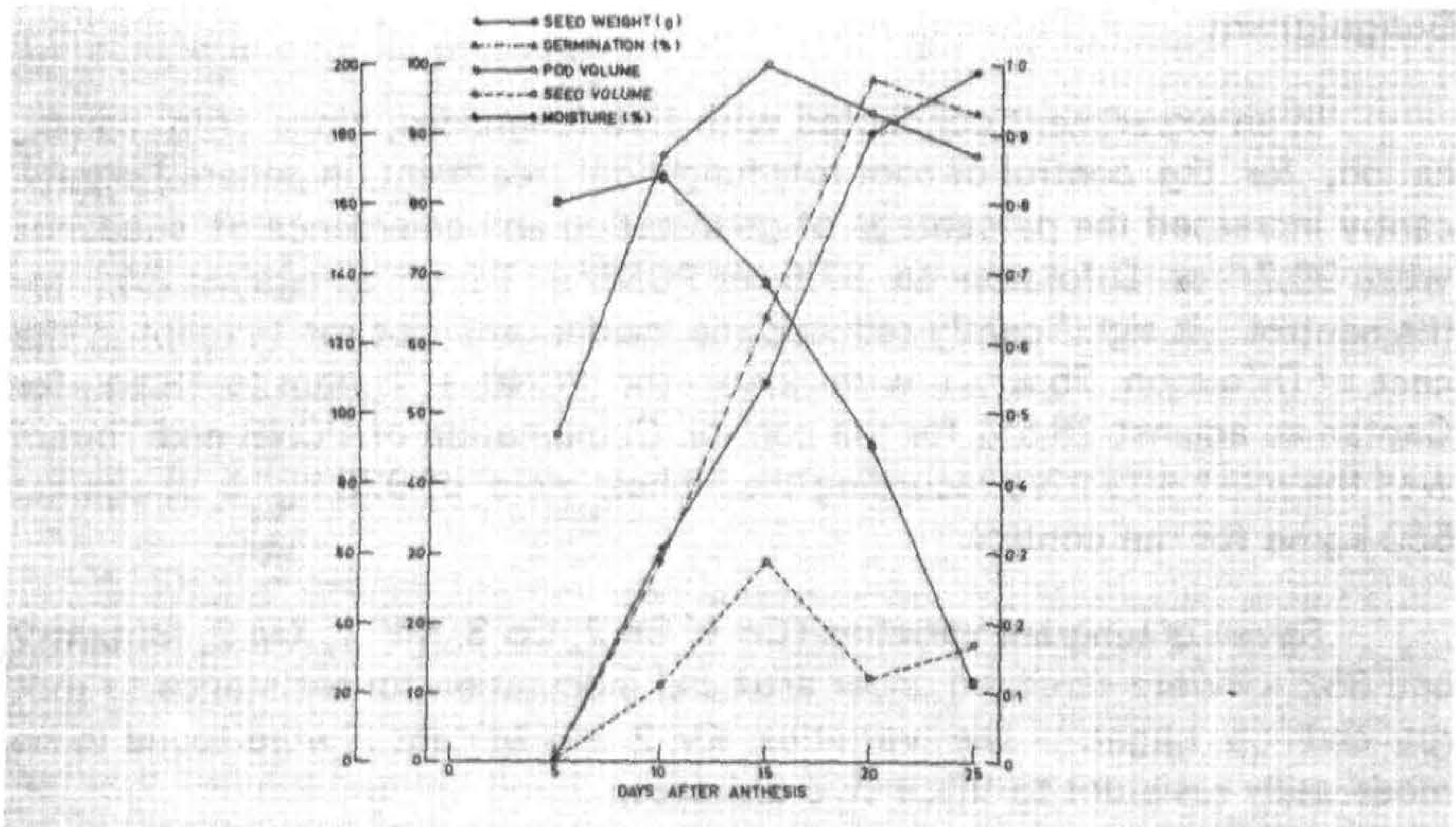


FIG.18 SEED DEVELOPMENT AND MATURATION IN BLACKGRAM Cv. CO 2

Bengalgram

Seed development and maturation were studied in Co 1 to determine the harvestable maturity. Pods reached the maximum size on 25th day after anthesis. Seeds attained physiological maturity on 35th day after anthesis, when the seed moisture content and germinability were 25.2 and 92 per cent, respectively (Fig. 19).

Greengram

Seed development and maturation studies in Co 3 indicated that for obtaining seeds with maximum viability, the crop should be harvested 20 days after anthesis. Delaying the harvest by 5 days increased the hard seed content from 12 per cent to 36 per cent (Fig. 20).

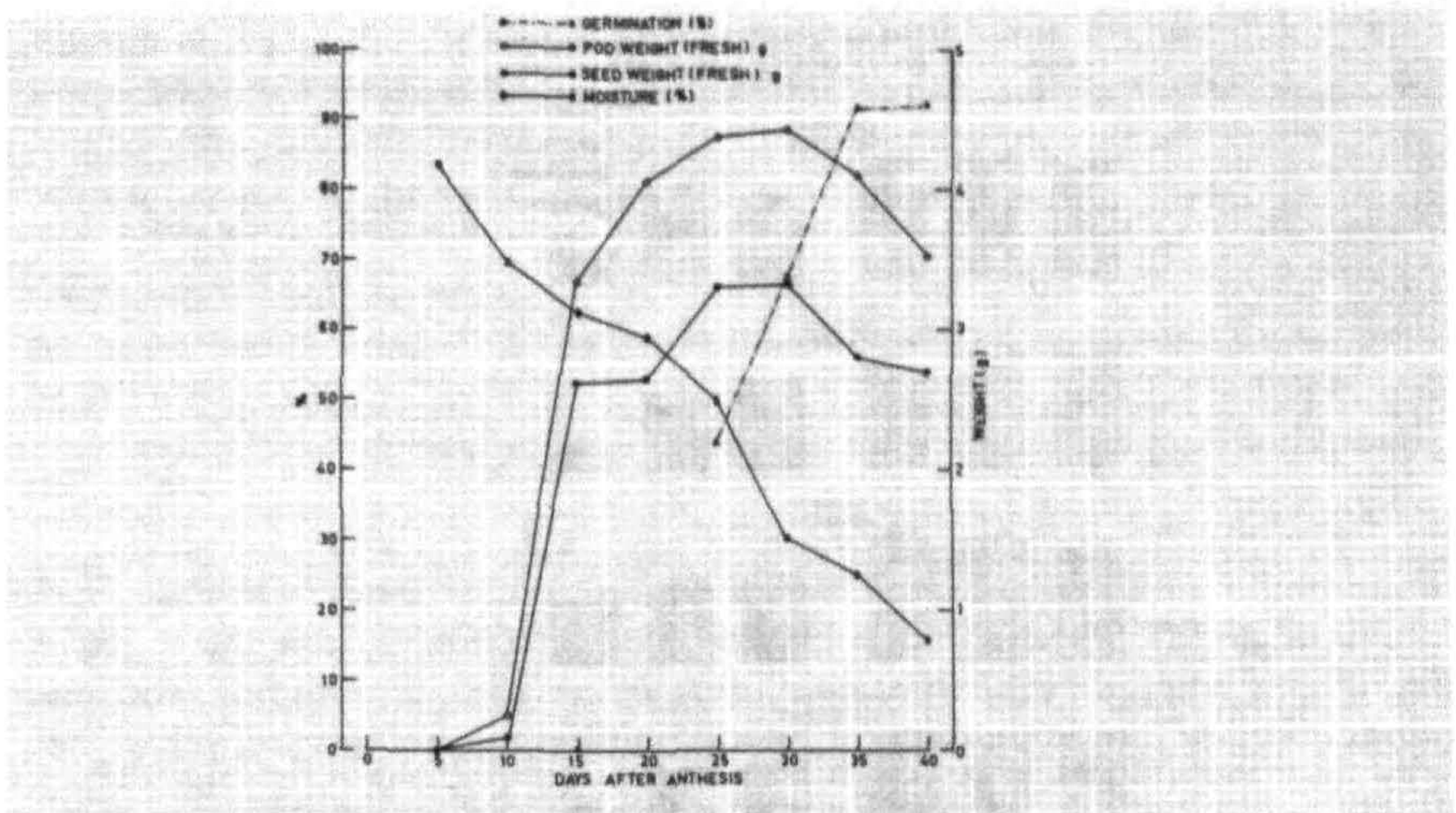


FIG.19 SEED DEVELOPMENT AND MATURATION-BENGALGRAM Cv. CO 1

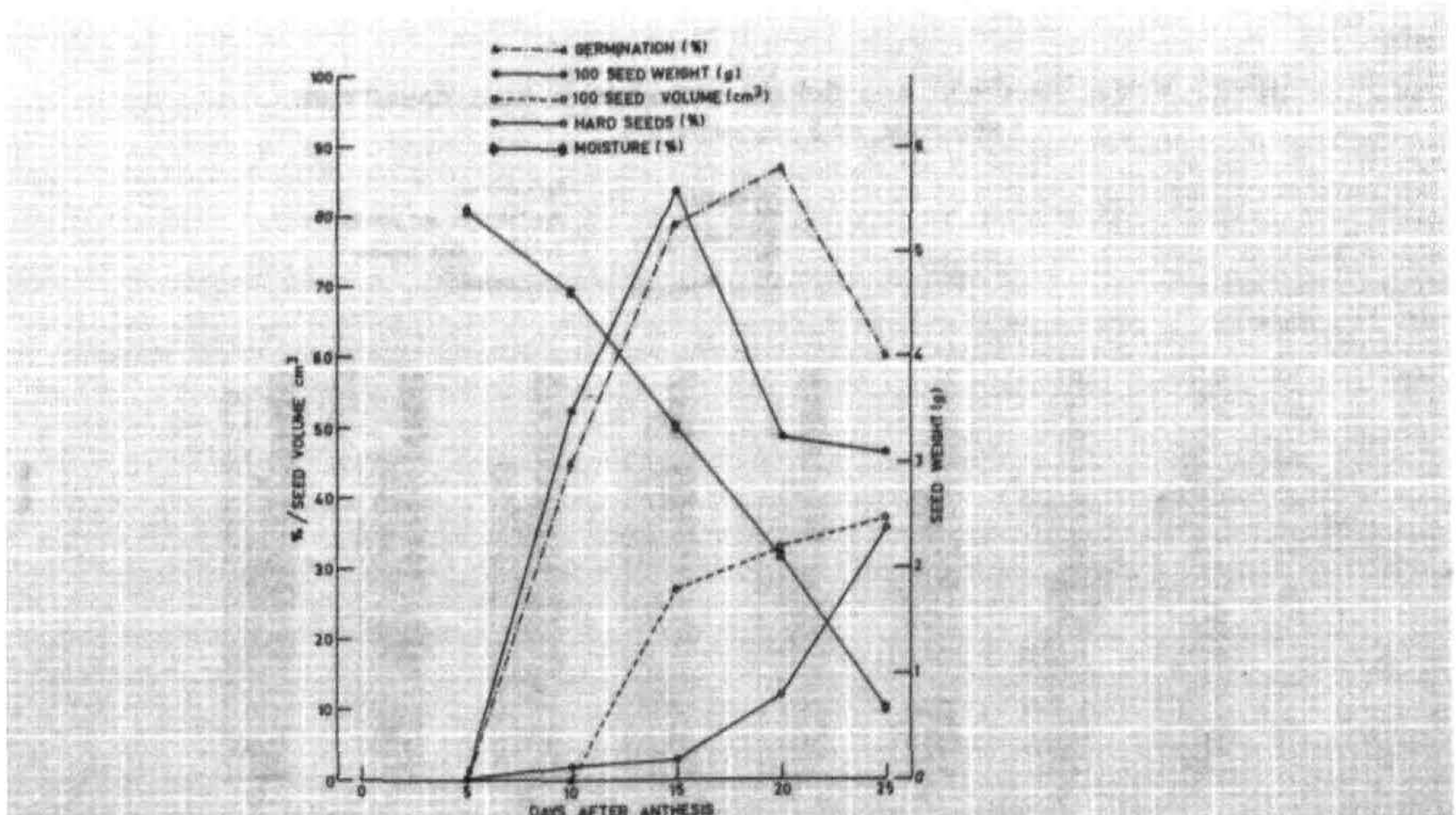


FIG.20 SEED DEVELOPMENT AND MATURATION IN GREENGRAM Cv. CO 2

FIG.21 EFFECT OF SEED TREATMENT AND STORAGE CONTAINERS ON SEED QUALITY OF NORMAL COLOUR AND OFF-COLOURED SEEDS OF CO2 GREENGRAM

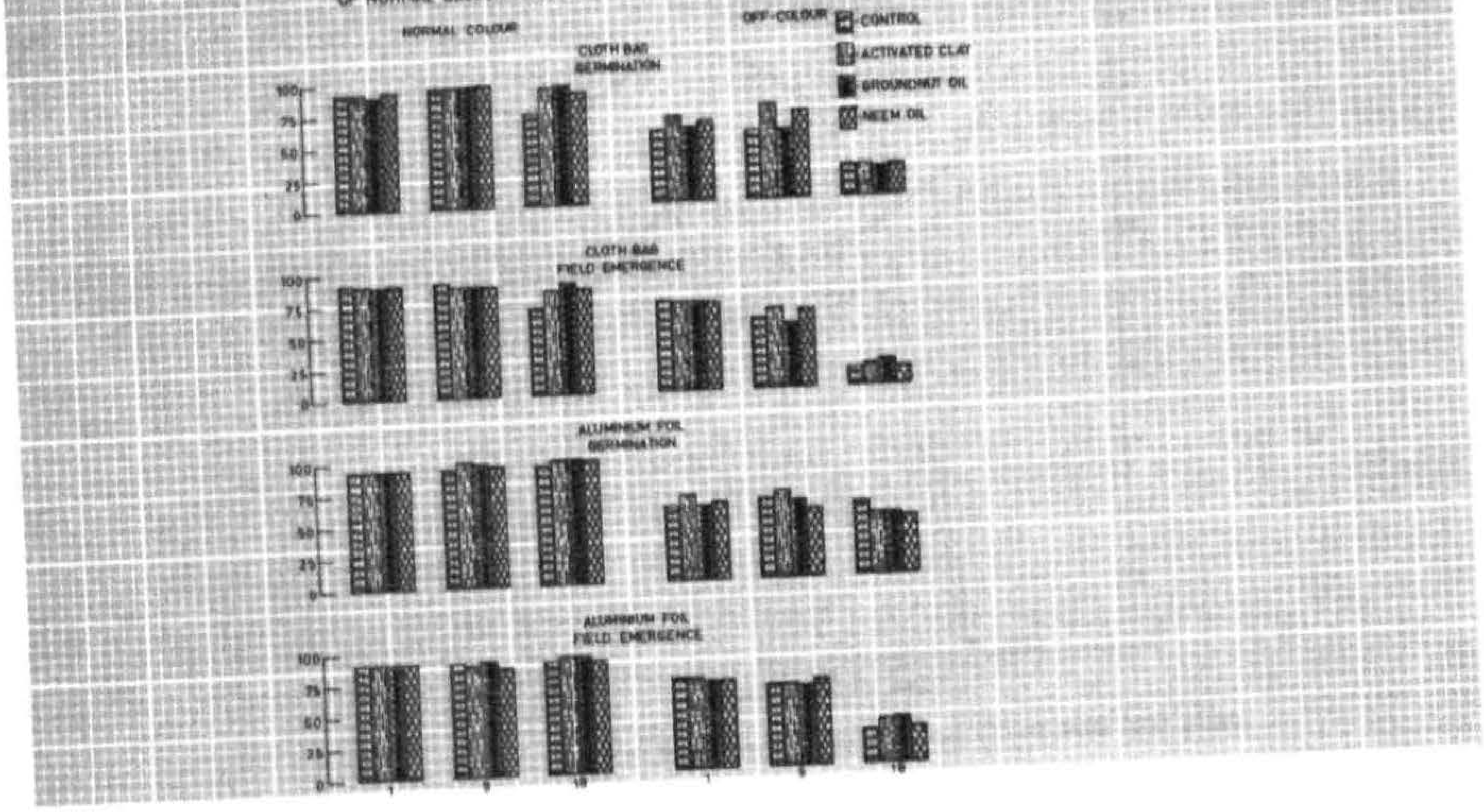
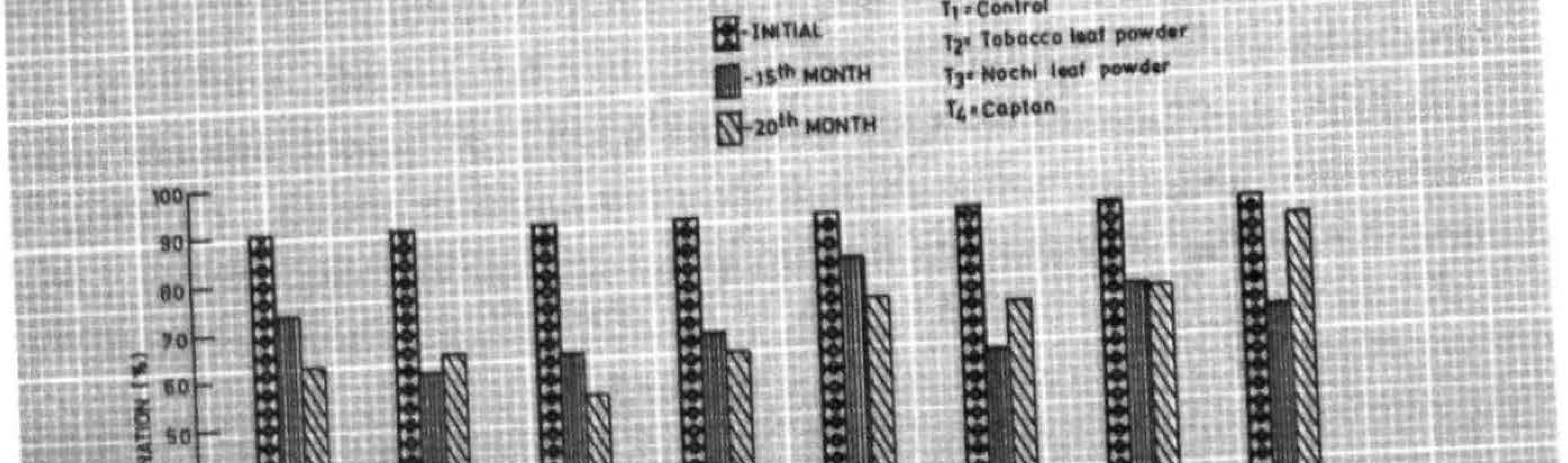


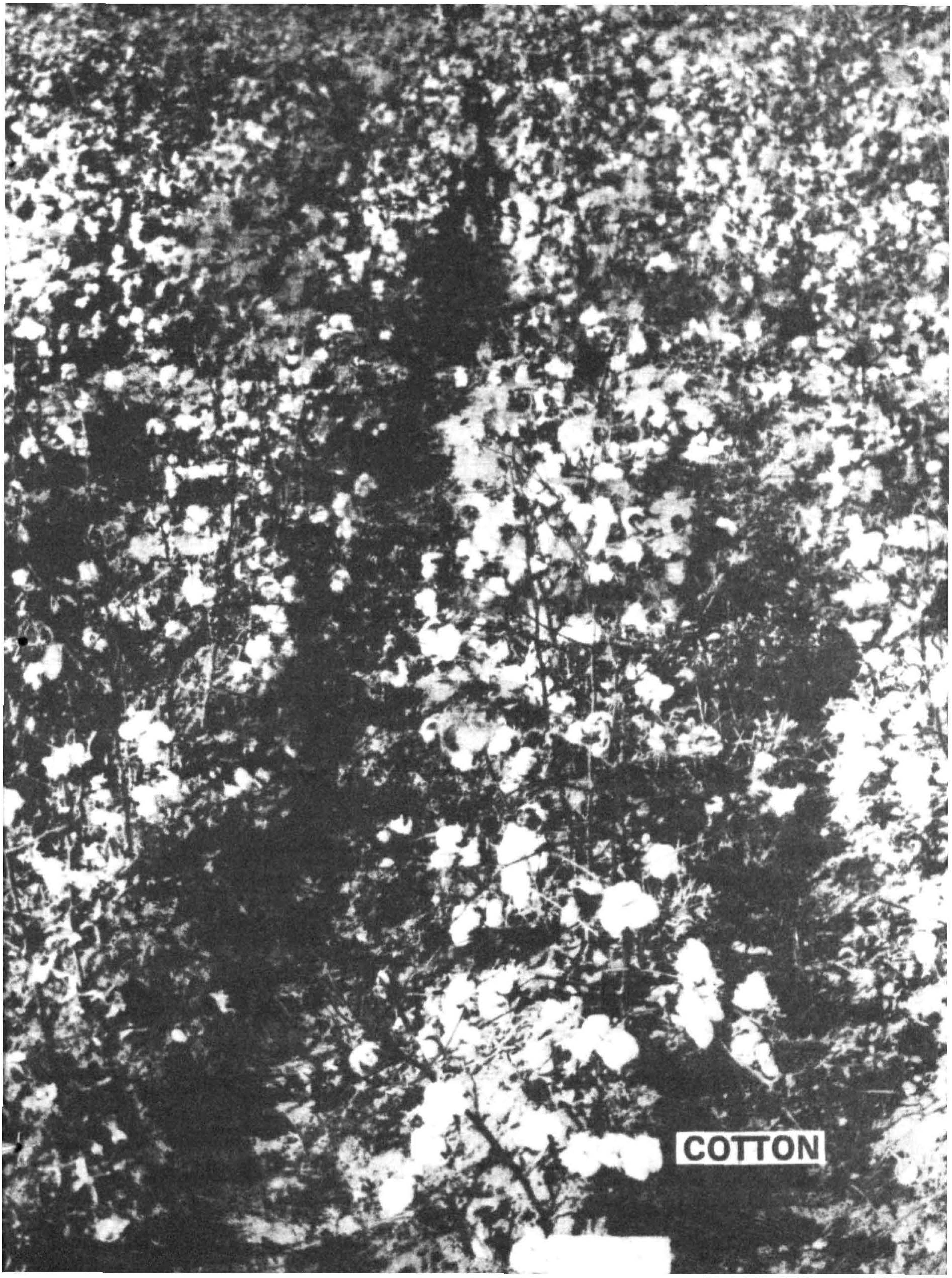
FIG.22 EFFECT OF SEED TREATMENT AND STORAGE CONTAINERS ON SEED VIABILITY IN REDGRAM CO 2 - GERMINATION



Seeds of Co 2 with initial germination of 99 per cent were stored at 8% seed moisture content under ambient temperature and relative humidity after storing them into normal coloured and off-coloured ones, treating them and packing them separately in moisture-pervious and moisture-vapour proof bags. Normal coloured seeds treated with thiram, with and without Nuvan and packed in vapour proof container germinated well both in the laboratory and in the field, up to 98 and 92 per cent, respectively at the end of 10 months of storage; the off-coloured counterparts germinated only upto 49 and 36 per cent. respectively. Hence the bulk seeds should be upgraded by removing the off-coloured seeds, if present, before sowing or storing (Fig. 21).

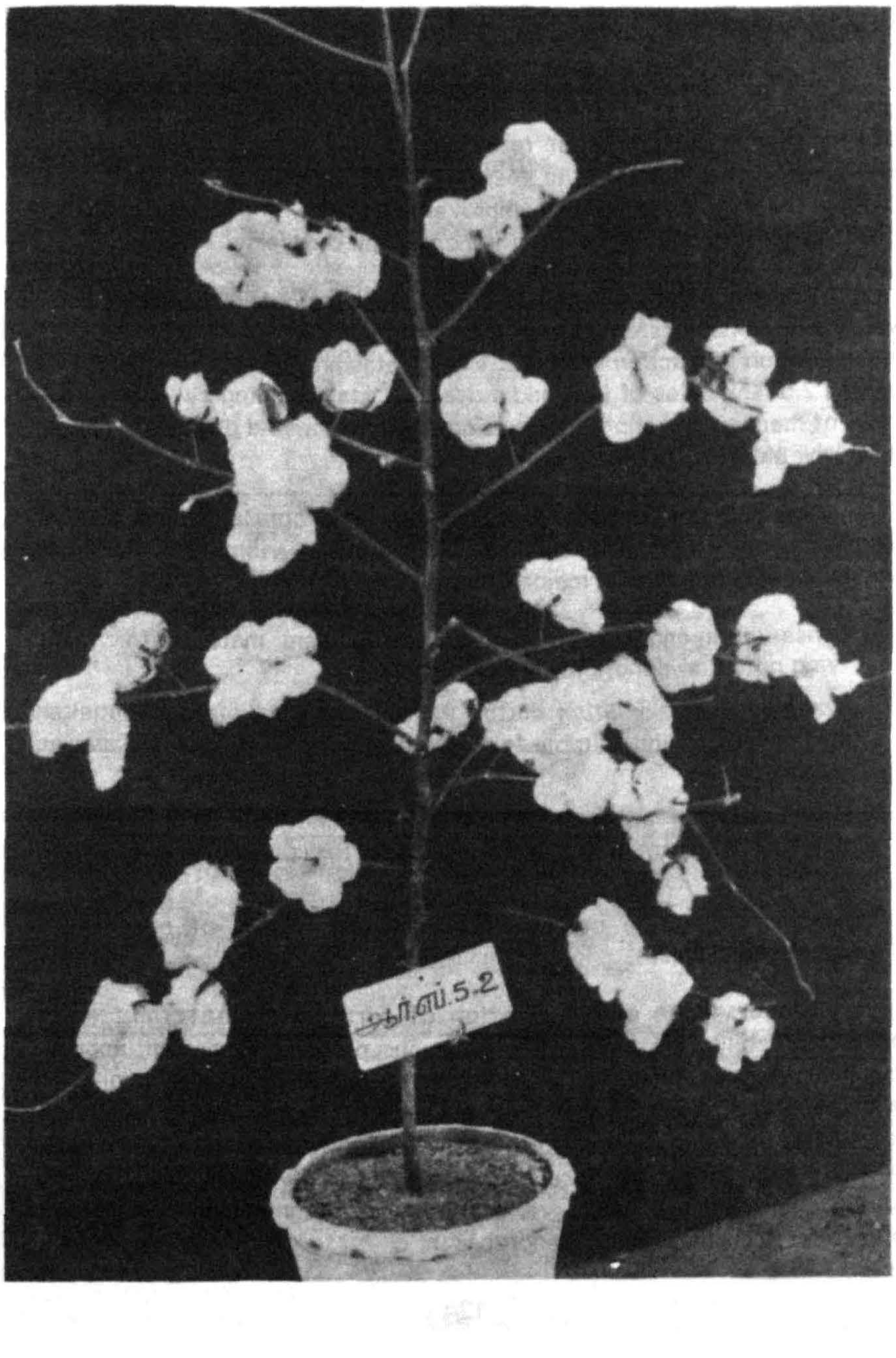
Redgram

Seeds of Co 2 with an initial viability of 90 per cent were dried to 8 per cent and stored under ambient conditions, after treating separately with tobacco leaf powder, nochi *(vitez negundo)* leaf powder and Captan 75% WDP and packing separately in moisture pervious and moisture-vapour proof containers. Seed treated with Captan and packed in moisture-vapour proof container recorded 86 per cent germination at the end of 20 months of storage (Fig. 22).


COTTON

CONTENTS

Crop Improvement	124
Germplasm	124
Varieties for rainfed tract	125
Varieties for rice-fallows	125
Varieties for long staple	126
Resistance Breeding	128
Crop Management	129
Conservation of moisture for rainfed cotton	129
Chemical defoliants in cotton	129
Azospirillum on cotton	129
Nutritional factors on oil content	130
Crop Protection	130
Management of pests	130



COTTON

Crop Improvement

Cotton is grown in 3.5 lakh hectares and occupies an important place in agricultural and industrial economy of Tamil Nadu. On account of concerted efforts in cotton research, production of raw cotton in this state has increased over the years and greatly influenced the fortunes of the mill indutry. Simultaneous improvement in quality and yield of cotton continue to be engaging the attention of cotton breeders.

While a major breakthrough in quality improvement has been achieved in cotton no substantial improvement in yield has been achieved. The annual cotton production in the state fluctuates around four lakh bales comprising 2.5 lahk bales of long and extra-long staple category and 1.5 lakh bales of medium and short staple as against the demand of about 3.57 and 9.50 lahk bales of these categories, respectively.

Breeding programmes in cotton are in progress in the different research centres of the University at Coimbatore, Srivilliputhur, Aduthurai, Kovilpatti and Paiyur with major focus on :

* Conservation and evaluation of the germplasm materials for identifying potential donors for hybridisation.
* Evaluating a *G. hirsutum* cotton variety, with high yield potential and medium staple and suitable for cultivation in rainfed black soil area and rice fallows.
* Development of an extra long staple cotton/hybrid with high yield potential, early maturity and adaptability for cultivation in winter and summer.
* Stabilisation of the potential through incorporation of resistance to pests and diseases.

Conservation and evaluation of germplasm material : Inflow of new variability is essential for continuous progress in a crop improvement programme. The basic source material is the germplasm collection which contains a rich diversity of genotypes. In our collection here, a total of 1110 genotypes comprising of 700 in *G. hirsutum*, 112 in *G. barbadense* and 298 in *G. arboreum* are maintianed, evaluated for their useful traits and utilised in the various breeding programmes with different objectives. Of these, nine genotypes in *G. hirsutum* were identified as

desirable for combination of economic traits like yield, length and ginning per cent and crossed to the adapted lines. Twenty eight genotypes with high yield and combining either length or ginning were also identified and utilised in the breeding programme. In addition, a number of *G. hirsutum* types were identified resistant to insects and diseases.

Evolution of *G. hirsutum* varieties for rainfed tract : The *hirsutum* variety MCU 6 released for the rainfed tract has not made much headway due to its erratic performance, susceptibility to pests and diseases and longer crop duration. Intensive testing of breeding materials at Coimbatore, Kovilpatti and Paiyur has revealed the superiority of three promising genotypes CRH 71, C 50 and SRT 1 over MCU 6. The yield potentials of these in the above three centres are given in Table 96.

TABLE 96. Yield performance of promising genotypes

(kg of kapas/ha)

Centre	Genotypes tested				Percentage
	MCU 6	CRH 71	C 50	SRT 1	over MCU 6
Coimbatore	532	769	—	—	44.5
Kovilpatti	348	—	456	—	31.0
Paiyur	891	—	—	1182	32.7

When they were simultaneously tested against MCU 6 in the above three centres over years, the genotypes SRT 1 and CRH 71 recorded a mean yield of 810 kg and 739 kg of seed, cotton/ha respectively, as compared to 529 kg for MCU 6 and 542 kg for C 50. All these three genotypes have been advanced to multilocation tests to assess their adaptability.

Evolution of *G. hirsutum* variety for rice-fallows : In order to make cotton cultivation in rice-fallows more remunerative, research efforts were intensified to develop a variety with higher yield potential than the ruling variety MCU 7. For this purpose, two new selections RF 5 - 2 and RF 5 - 3 of C 1998 x MCU 5 parentage were identified and compared with MCU 7. While their seed cotton yield was comparable to that of MCU 7, they have given 15 - 25 per cent higher lint yield by virtue of their significantly higher ginning outturn (37 - 38 per cent) than MCU 7 (33%).

The two hybrids have been advanced to adaptive research trials to confirm their superiority over Varalaxmi.

As a continuous process of evolving interspecific hybrids, 461 combinations of *G. hirsutum* and *G. barbadense* types are under study during 1980-81. Fresh crosses involving 207 *G. hirsutum* and 30 *G. barbadense* types have also been effected during 1980-81 winter for exploitation of hybrid vigour.

From intensive work carried out at Cotton Research Station, Srivilliputhur for evolving an extra long staple *G. hirsutum* variety suited for cultivation in the place of MCU 8 cotton in the Summer Cambodia Tract, three new genotypes have been identified as promising and superior to MCU 8 in yield and ginning while being equal for lint quality attributes.(Table 101)

All these have been nominated for testing in the All India Coordinated Varietal Trials for assessing their superiority and adaptability.

TABLE 101. Performance of extra long staple *G. hirsutum* varieties

Selections	Kapas Yield kg/ha	Percentage over check	Mean halo length (mm)	G.P.	Micro naire value	Bundle strength (PSI)	CSP for		
							30s	50s	70s
EL 0668-D	2137	17.4	30.0	36.9	3.95	8.4	2451	2208	1939
EL 0687-B	2099	15.3	29.7	35.3	3.80	8.6	2506	2214	1956
TSH 25	2059	13.1	29.5	35.4	3.68	8.6	2357	2158	1885
MCU 8	1821	—	31.3	34.7	3.35	8.8	2455	2267	1967

RESISTANCE BREEDING

In preliminary strain trial, five families viz. TSH 99, TSH 105, TSH 109, TSH 111 and TSH 113 out of eight tested, were significantly superior in yield to MCU 8. They maintained their superiority to MCU 8 in the compact family block also, conducted simultaneously, for assessment of their purity of economic traits. Among these, two families namely TSH 105 and TSH 111 were observed to be equal in ginning percent and halo-length to MCU 8.

Testing and evaluation of 24 progenies under Progeny Row Test revealed that TSH 118, TSH 124, TSH 124, TSH 126, TSH 127 and TSH 134 were desirable for significant yield improvement over MCU 8 with comparable ginning out turn and other fibre properties.

The results of Co-ordinated Varietal Trials conducted at this Centre over a period of years revealed that the entries CP 25-1, ELS 271-A-1, ELS 391, DS 70-480, UAS 70-480-2 and CP 2-1 were superior to MCU 8 in yield.

In our efforts to identify suitable breeding materials with resistance to jassid, and diseases, the following resistant hirsutum types were identified: Bar NT 58/43, 170-Co 2-2-22, BL JR 14/29, ELS 405, HB 20, Co And 8-3-2, HS 22, 170 Co 2 and 170 Co 2 M. Five cultures, CRH 71, BREC 95308, BR 101-1023, HRAL 231-2 and Raba B-50 were identified as resistant to bacterial blight, and were utilized in hybridisation programmes involving popular varieties like MCU 5, MCU 9 and Laxmi cotton.

Crop Management

Conservation of moisture for rainfed cotton: The yield of rainfed cotton showed an increase with the adoption of the moisture conservation practices. Among the practices tried, opening the furrow at first interculture and tying the ridges by 15th November under paired row of planting of cotton, resulted in higher percentage of soil moisture at squaring stage, thereby influencing the yield of cotton.

Effect of chemical defoliants on cotton: Experiment was conducted to find out the effect of chemical defoliants on yield of seed cotton, fibre qualities and earliness in maturity by using chemid (Sodium salts of Cacodylic acid), paraquat and common salts (Sodium chloride) at rates of 2.5 l/ha, 3.0 l/ha and 10 per cent respectively. The chemical chemaid at 2.5 l/ha at 80% boll opening gave the highest seed cotton yield of 21.1 q/ha. By using chemaid and paraquat, the maturity was hastened by a week without any adverse effect on the fibre qualities. (Table 102)

TABLE 102. Effect of Chemicals on yield and quality characters of Cotton (MCU 9)

Treatment	Leaf shedding (percentage)	Boll opening (percentage)	Seed Cotton yield (kg/ha)	Mean fibre length (mm)
Control	26.53	30.90	1872	29.48
Chemaid	68.00	79.20	2110	29.57
Paraquat	89.35	80.80	1941	29.50
Sodium Chloride	34.02	34.40	1889	29.25

Effects of Azospirillum on Cotton: The results of a field trial conducted at the Cotton Breeding, Station, Coimbatore on the effect of

Azospirillum inoculations on MCU 7 variety of cotton indicated that the inoculant could save 33 to 50% of fertilizer nitrogen without affecting the yield. While Azospirillum with half the recommended level of fertilizer nitrogen recorded a kapas yield of 1500 kg/ha, full dose of fertilizer nitrogen gave 1309 kg/ha only.

Effect of nutritional factors on oil content in cotton: Application of phosphorus at 65 kg/ha increased the oil content of cotton seeds by 2.3 per cent over control and further addition of P decreased the oil content.

Nitrogen in combination with phosphorus resulted in the highest oil content of 21.2 per cent and it was lowest (18.0 per cent) in the compost treatment.

Crop Protection

Management of pests: Among the various insecticides tested, the synthetic pyrethroids were significantly superior in checking the bollworm incidence. Among pyrethroid compounds, lowest infestation (9.8%) and highest yield (1753 kg/ha) were recorded in the cypermethrin (Ripcord) treated plot as against 49.5% infestation and 880 kg/ha yield in control plot. The percentage of infestation was 13.00 in the pests treated with fenvalerate.

Highest catch of male pink bollworm moth was found in yellow pan water trap and bait with 60% Z, Z isomer of the sexpheromone, gossyplure to monitor pink bollworms of cotton. Black tray water traps and bait with 60% Z, Z isomer was the next best. Water pan traps were more efficacious than sticky delta traps and yellow pan traps were the most efficient followed by red pan and black tray traps.

In a compatibility study on pesticides, fertilizers and monocrotophos (0.05%),. Phosalone (0.7%) and diflubenzuron (250 ppm) were found to be compatible with diammonium phosphate (1%) and magnesium sulphate (1%). Addition of the sticker 'Sandorit' at 2 ml/litre of spray solutions caused no deleterious effect.

* * *

HORTICULTURAL CROPS
IM39

CONTENTS

Fruits

Crop Improvement	133
Crop Management	134
Soil Management	136
Management of Insect Pests	136

Vegetables

Crop Improvement	138
Crop Management	144
Soil Management	144
Crop Protection	146

Flowers

Crop Improvement	152
Agro Techniques	154

Spices and Plantation Crops

Crop Improvement	158
Crop Management	159
Soil Management	162
Pest Management	163
Disease Management	166

HORTICULTURAL CROPS

FRUITS

Crop Improvement

PKM 1 Mango a clonal selection: From the evaluation studies on mango, a variety 2/7 hybrid was spotted as promising and released as PKM 1 mango. This hybrid is a clonal selection from a hybrid, the parents of which are Chinnaswarnerekha and Neelum which are well known cultivars in South India, the former yielding 'above average quality' fruits with attractive cadmium coloured skin with jasper red flesh, while the latter is renowned for its heavy regular yields with 'average quality' fruits. Three grafts of the hybrid were planted in 1959, among which this clone is found promising. A mean yield of 536 fruits with 102.7 kg was obtained / tree / year, with a maximum yield of 1420 fruits weighing 284.0 kg. The yield has been steady and regular. The hybrid bears fruits in clusters and the fruits are fairly big and of very sweet taste.

The PKM 1 mango variety is suitable for commercial cultivation in Madurai, Ramanathapuram, Tirunelveli, Dharmapuri, Tiruchi, Salem, Pudukkottai, North Arcot and Coimbatore districts of Tamil Nadu. (Plate 27).

PKM 1 Sapota, a clonal selection: From evaluation studies on Sapota, a variety AZ 16 was found promising and has been released as PKM 1 Sapota. This strain, a clonal selection from variety 'Guthi' yielded 3547 fruits weighing 236 kg. A maximum yield of 280 kg/tree/year was obtained during 1979. The tree is dwarf in stature (9.40 m in 20 years of age) with a spread of 10.40 m on north - south direction and 9.70 m on east-west direction. The fruits are similar to Pala and Oval cultivars. Fruits are in two shapes viz. round and oval. The skin is very thin like potato and the pulp is butter like being very sweet with T. S. S. content of 24° Brix. Fruits are medium in size (88.00 - 125.00 g). This type is an adaptable one for the southern and central districts af Tamil Nadu (Plate 28).

A new red banana for home gardens: A new diploid banana with red fruit skin was selected for some desirable attributes. In addition to attractive fruit colour, the clone is hardy, medium tall with shorter duration of 12-13 months as against 17-18 months of taller red banana. (Table 103). It is highly resistant to leaf spot and fairly tolerant to nematodes and bunchy top. It suckers profusely and its ratooning

potential is higher. This facilitates harvesting of more bunches in a given peried of years. The fruit skin is reddish purple turning to bright crimson on ripening. The flesh is orange yellow in colour. It is ideally suited to urban home gardens. (Plate 29).

TABLE 103. Comparison of diploid red banana with traditional red banana

Characters	Diploid red banana	Red banana
Duration (month)	12-13	17-18
Plant height (m)	2.8-3.3	3.8-4.1
Plant girth (cm)	53-56	85-95
Bunch weight (kg)	10-15	12-18
Number of hands	8-10	5-7
Number of fingers	110-130	90-110
Finger length (cm)	15-18	15-18
Finger girth (cm)	9-10	13-14
Number of suckers	10-15	5-8
TSS (° Brix)	16-22	17-23

Synthesis of nematode - resistant diploid banana: The hybridization in banana has yielded a diploid (A A genome) resistant to nematodes. The parental combination is 'Matti' (A A) - a choice clone of Kanyakumari district as female parent and 'Pisang lilin' (AA), a Malayan edible diploid as male. The selected hybrid progeny of this cross has has retained many of the good traits of 'Matti' (AA) with an additional character of nematode resistance, derived from 'Pisang lilin', The F_1 bears a bunch which has vertical hang, a character not found in either of the parents, but a much favoured economic trait. This may serve as a potential diploid male parent in future breeding programme, by virtue of its fertility, nematode resistance and desirable hand and conformity of the bunch. (Plate 30).

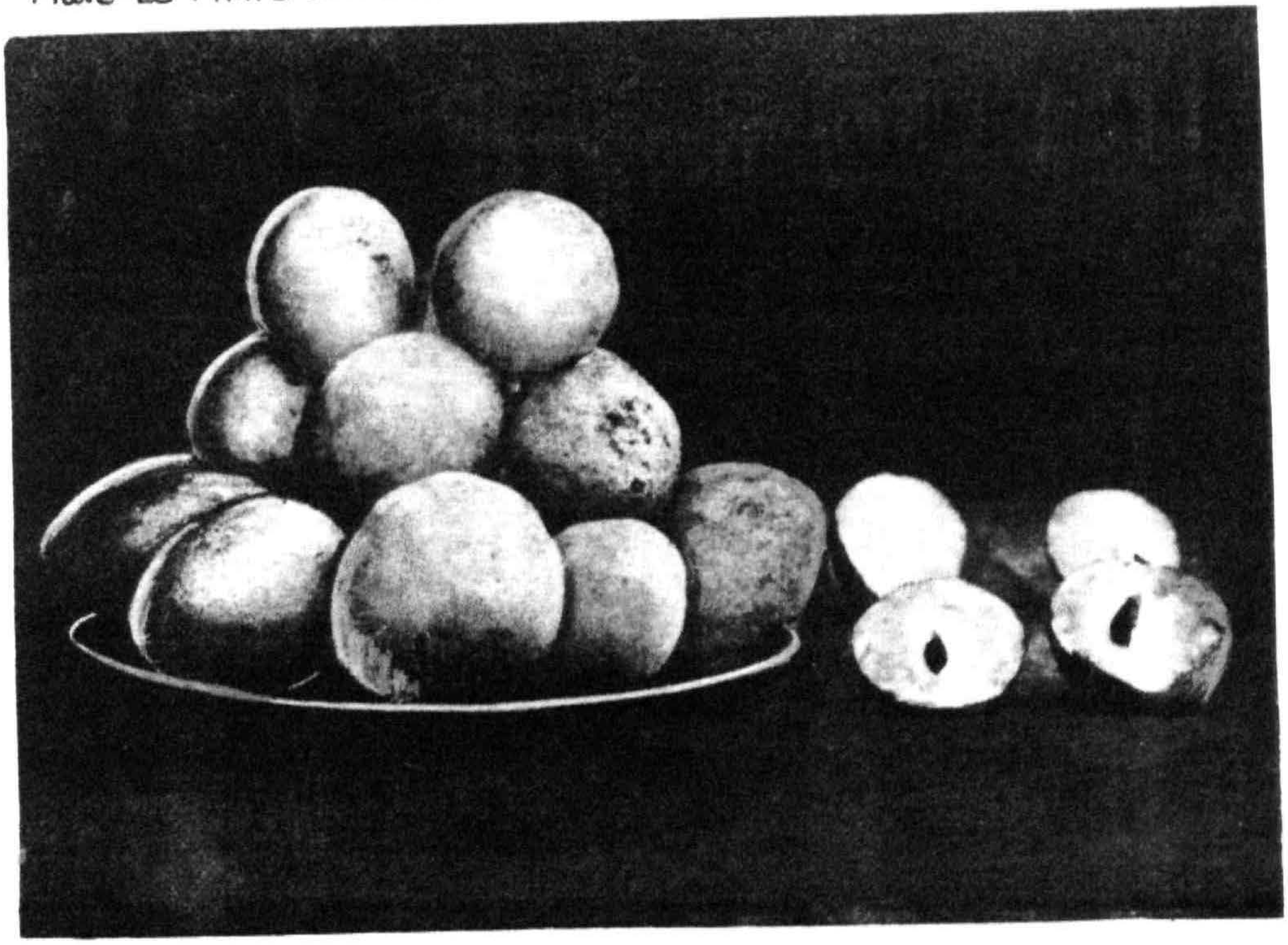
Acid Lime: Among the different rootstocks tested, rough lemon *(Citrus jambhiri)* was found to be suitable rootstock for acid lime in respect of increased tree vigour, good stock-scion congeniality and early fruit production.

Crop Management

Harmonal spray to boost hill banana yields: Spraying of 2, 4 D at 25 ppm after the opening of the last hand in the bunch increased the bunch weight and fruit size. The yield and quality attributes of the sprayed and unsprayed bunches are given in Table 104.

Plate: 27 PKM 1 MANGO

Plate : 28 PKM 1 SAPOTA



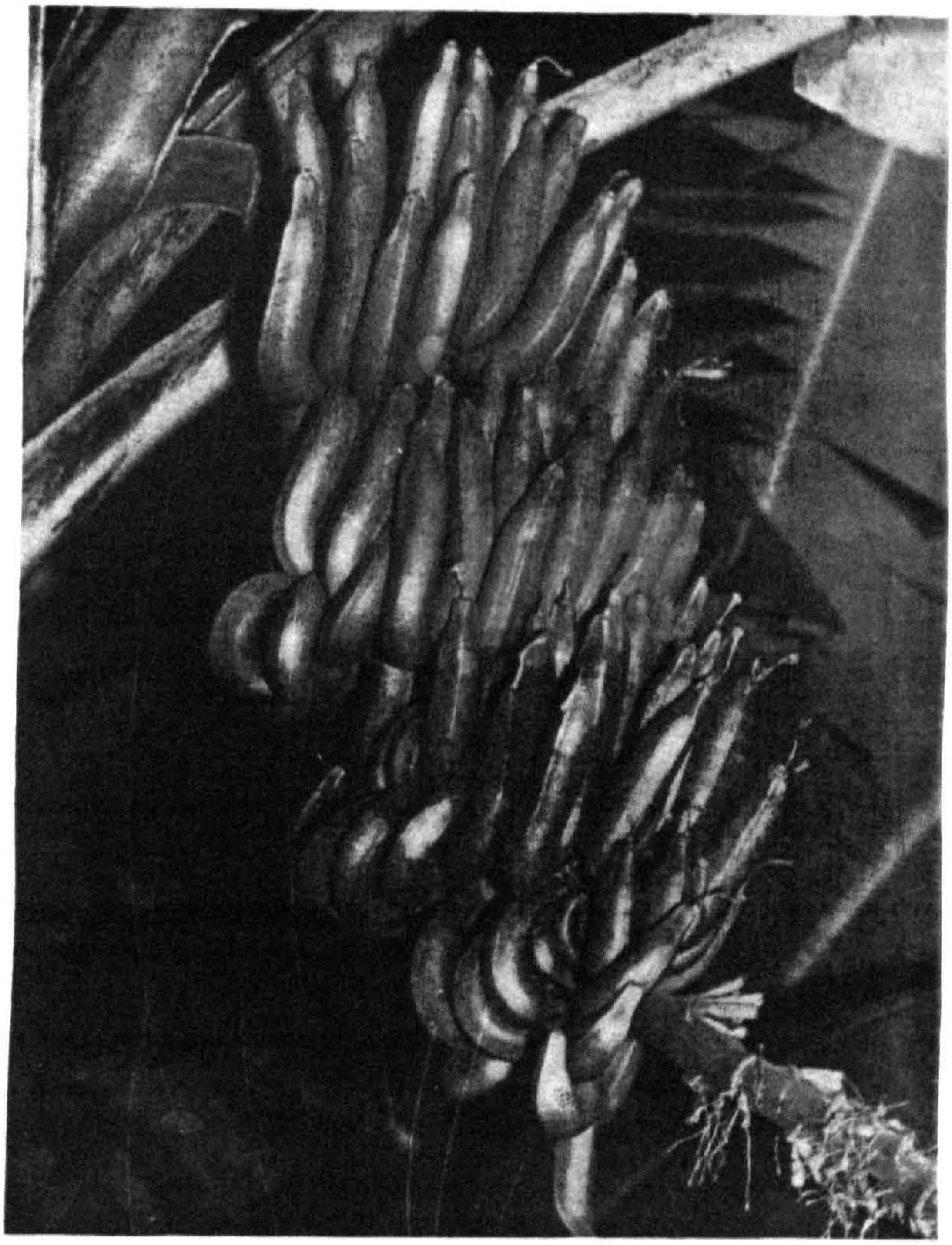


Plate: 29 DIPLOID RED BANANA (AA1)
FOR HOME GARDENS

Plate : 30 NEMATODE - RESISTANT
DIPLOID BANANA (M 74)
(MATTIX PISANG LILIN)

TABLE 104. The yield and quality of 2,4-D sprayed and unsprayed Virupakshi banana

Character	Sprayed	Unsprayed
Yield		
Bunch weight (kg)	18.50	11.00
Number of hands	7	7
Number of fingers	86	90
Fruit length (cm)	23.5	16.5
Fruit mid circumferences (cm)	21.5	15.5
Quality		
Total soluble solids (Brix)	23.5	24.0
Total sugar (%)	18.86	17.54
Reducing sugar (%)	13.63	14.29
Non-reducing sugar (%)	5.23	3.25
Total acidity (%)	0.47	0.47

Intercropping in Banana garden : A study was undertaken to evolve a suitable cropping system for "Dwarf cavendish" banana grown under two population densities of 4166 (1.2 x 2.0 m) and 5000 (1.0 x 1.6 x 2.4) plants per ha, to assess the possibility of utilizing the cubic volume of space available between the plant rows. The inter crops growh had no influence on plant growth and yield of banana.

Under hedge row planting (1.0 x 1.6 x 2.4 m), intercropping of banana with lab-lab, tomato and blackgram gave the highest net returns, while under normal spacing (1.2 x 2.0 m) lab-lab and tomato combination found superior. The additional net return realized in plots with 72 m^2 size was Rs. 61 in the former and Rs. 59 in the latter.

Rapid propagation of pre-immunised acid lime plants : Studies employing intermittant mist propagation technique to root semi-hard wood terminal stem cuttings of acid lime (*Citrus aurantifolia*) recorded 72% rooting in cuttings treated with IBA 1000 ppm as compared to 31% in conventional method (open bed) with IBA treatment. This has enabled mass production of pre-immunised planting material in a shorter period of 30 days instead of 52 days in the conventional method.

Green leaf mulch in acid lime gardens : Application of green leaf mulch (30 kg/tree) significantly improved tree height, canopy, fruit weight, juice content besides arresting weed growth. It also conserved soil moisture efficiently.

Shevaroy Hills suited for Pineapple : The pineapple crop was planted both in the open and under the diffused shade of country pear

trees. The crop came to harvest in 22 months after planting and 58.8 tonnes of yield were obtained from one hectare. The performance of the crop was equally good in the open as well as under shade of country pear trees and the economics was highly favourable. It is recommended as an intercrop in new coffee plantations in the first 3-4 years after planting. Besides giving income during the unproductive phase of the coffee crop, pineapple cultivation can also suppress weeds, maintain soil fertility and control soil erosion. The crop will also be a boon to small and tribal farmers of these hills as there is ready market for the fruits. The crop comes up well under rainfed conditions.

Soil Management

Fertilizer trial on guava : A fertilizer trial on Lucknow 46 guava (seven years old) with application of N at 0.5, 1.0 and 1.5 kg; K at 0.5, 1.0 and 1.5 kg; constant P with 1 kg/tree was conducted. Maximum yield of 2686 fruits/tree weighing 110.03 kg was obtained with N, P and K at 1 kg/tree, amounting to 10.21 and 21.91%. The increase in fruit number and fruit weight over the control were 10.21 and 21.91% respectively.

Application of Micronutrients on guava : Spraying boron at 0.3% concentration was efficient in correcting the boron deficiency in guava. Spraying boron at 0.3% concentration in combination with either iron 0.25% or zinc 0.5% was found effective in reducing the cracking of fruits. Maximum yield of 2654 fruits was obtained when treated with zinc 0.5% + iron 0.25% and 2240 fruits with urea 1% + iron 0.25%

Manurial studies on acid lime : Application of 600 g of N, 200 g of P and 300 g of K/plant/year in two split doses was found to induce maximum growth in four year old acid lime trees increasing the fruit yield to 234 number/tree.

Management of insects and pests

Stem borer management : Application of half to one tablet of celphos in the bore holes or injecting 20 ml of 0.1% dichlorvos and then plastering the bore holes with wet earth recorded cent percent mortality of the stem borer grubs. In padding method, application of 10 ml of monocrotophos or dimethoate over absorbent cotton after removing 5 cm^2 bark in the trunk region also controlled the grubs, to an extent of sixty percent.

Mangonut weevil management : Studies with various available insecticides under field conditions, indicated that the spraying of any one of the chemicals viz., fenthion 0.1%, carbaryl 0,2%, fenvalerate 0.2%' and

FMC 35001 0.1% given during the period of egg-laying, completely controlled the mangonut weevil. Varieties like Thilpasand and Pottalma showed low egg laying perference while variety like Rumani showed low incidence in mature fruits.

Leaf Miner management in Citrus: Spraying with methyl demeton or phosphomidan or quinalphos was found to be effective for the control of citrus leaf miner, *Phyllocnistis citrella*. It was observed that spraying with either methyl parathion or neem oil or chlorpyriphos was effective in controlling citrus leaf caterpillar, *Papilio demoleas*.

Management of Citrus nematodes: Application of Aldicarb 10 g or Carbofuran 3 g at 4 kg ai/ha was found effective for the control of citrus nematode, *Tylenchulus semipenetrans*.

Management of Tea mosquito bug in guava: Application of Carbaryl 0.1% or Phasalone (0.07%) at the time of flowering and fruit set in guava is effective for the control of Tea mosquito bug.

Nematode infestation in banana: A survey of different districts of Tamil Nadu revealed the persence of the burrowing nematode, *(Redopholus similies)* the root lesion nematode, *(Pratylenchus coffeae)* the banana spiral nematode *(Helicotylenchus multicinctus)* and the root knot nematode (*Meloidgyne incognita* and *M. Javanica*) species. The burrowing nematode, the specific banana race, is prevalent in Coimbatore, Tiruchirapalli, Chingleput, Pudukottai, Tirunelveli, Kanyakumari, Madurai, Ramanathapuram, North Arcot, Selam and Periyar districts. The common cultivars harbouring nematodes are Dwarf Cavendish, Robusta, Poovan, Monthan, Rasthali, Red banana, Virupakshi, Matti and Nendran.

Management of twig blight in citrus: Pruning the dried twigs and spraying with Fytolan (insoluble copper) at 0.3% was found to be effective for the control of twig blight caused by *Colletotrichum gleosporioides*. Management of sooty mould in Mandarin *(Citrus reticulate blanco)*: Spraying ½ litre of Metasystox (2 ml of metasystox in 1 litre of water) per tree and after three days, spraying maida grual at one litre per tree will control the sooty mould. There was significant increase in yield and quality in the sooty mould controlled plant. The maida gruel is prepared by mixing and boiling 1 kg of maida with 5 litres of water. After cooling, for 1 litre of gruel, 2 litre of water be added and sprayed.

Phanerogamic Parasite *Loranthus longiflorus* **on Mandarin:** The reduction in yield brought about by this parasite in citrus ranged between 48.13 to 89.68% depending on the severity of infestation.

VEGETABLES

Crop Improvement

'Marutham' Tomato : The mutant IM 39, released as 'Marutham' was evolved through induced mutation by treating the seeds of Co 1 Tomato with EMS. Plants are compact, less spreading, dwarf and determinate. It lends itself for high density planting with a spacing of 60 x 30 cm accomodating 50,000 plants per hectare. Fruits are borne in clusters of 4 to 5 in each (Plate 31). Fruits are round, smooth and attractive each weighing 45 to 50 g. Fruits are rich in Vitamin C (25 mg/100 g) with a TSS of 3.2 and acidity of 3.8 per cent. The flesh to seed ratio is 167 : 1. The crop duration is shorter with 110 - 115 days as compared to other popular varieties. It yields on an average 50 t of fruits/ha recording 50 and 33 per cent increase over Co 1 and Co 2 tomato respectively, The mutant performed well in both summer and monsoon season. (Table 105).

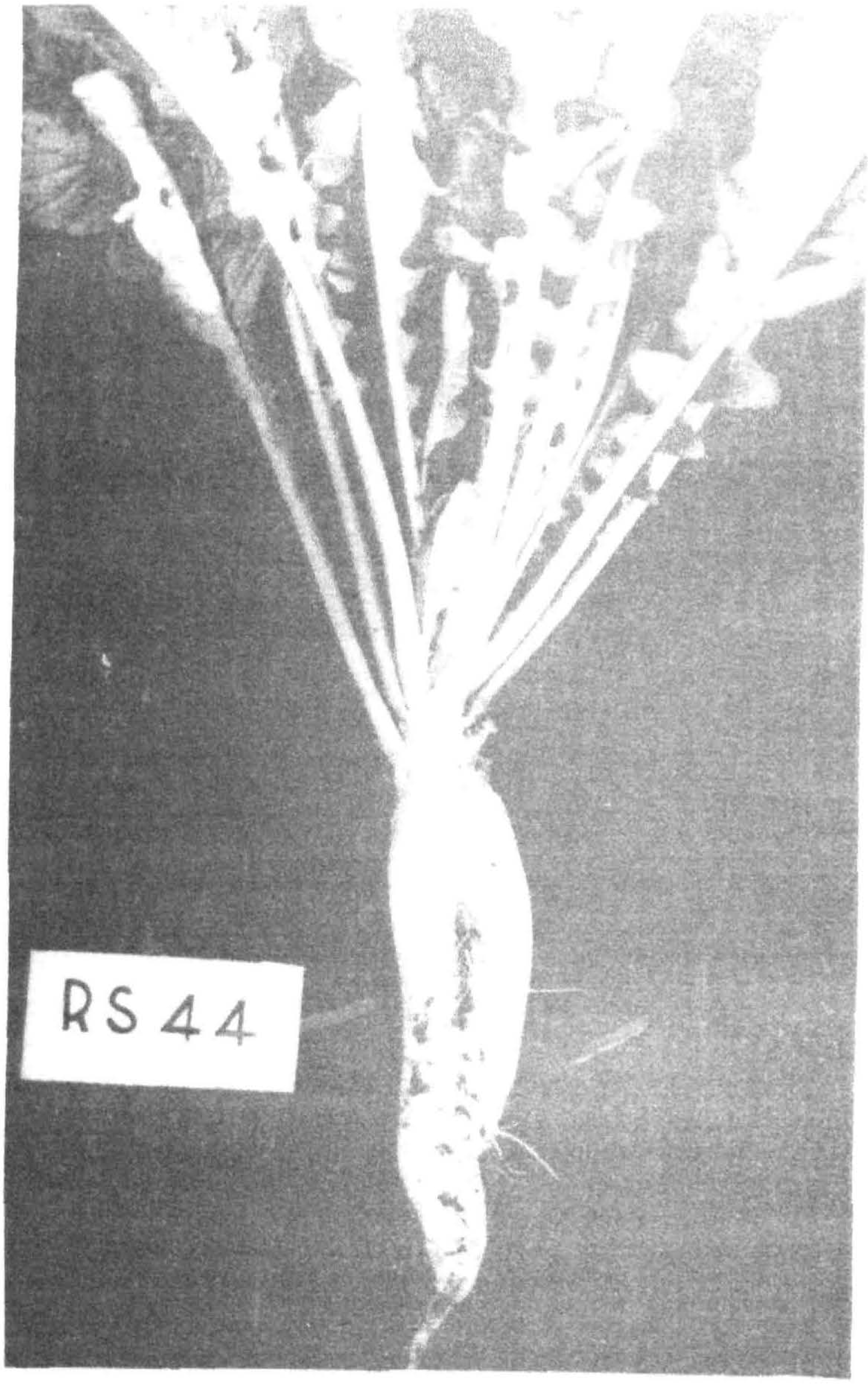
TABLE 105. Performance of 'Marutham' (IM 39) compared to Co 1 and Co 2 (yield kg/ha)

Year	Season	IM 39	Co 1	Co 2	Percentage increase over	
		60x30 cm	75x60 cm	75x60 cm	Co 1	Co 2
1975	Summer	48,000	30,217	34,417	58.85	39.46
1975	Monsoon	50,000	35,216	39,618	42.00	26.20
1976	Summer	49,466	30,615	33,610	61.54	47.14
1976	Monsoon	50,112	37,641	42,748	33.13	17.13
1977	Summer	51,576	30,500	32,650	69.10	57.96
1980	Summer	49,610	29,272	33,110	60.47	49.83
1980	Monsoon	50,140	35,068	40,670	42.97	23.28
Mean		49,872	33,063	37,229	50.83	33.96
Mean of Summer Seasons		49,660	30,151	33,446	64.70	48.47
Meae of Monsoon Seasons		50,084	35,975	41,012	39.21	22.12

Co 3 Amarathus - A clipping variety : Culture A 83 named Co 3 is a selection from a local type collected from Thirumayam of Madurai district and it was tested for three years from 1977 to 1979, covering five seasons in the university campus and other research stations and also in 17 private holdings covering five districts. This culture was found adaptable throughout Tamil Nadu and could be cultivated throughout

Plate 31 MARUTHAM TOMATO

Plate 32 CO1 RAD



the year. The Culture A 83 has yielded 30,716 kg of greens/ha as compared to 19431 kg in the non descript local cultivar recording increase over the local. (Table 106). This culture lends itself for the ten clippings commencing from 20 days after sowing and provides a continuous supply of luscious tender greens for a period of 3 months. The high leaf/stem ratio exceeding 2.0 adds to the acceptability and palatability of the cooked greens. This culture is also nutritious, containing 35.9 mg of ascorbic acid, 11.04 mg of carotene in 100 g of fresh matter. On dry weight basis, it contains 12.5 per cent protein, 17,4 per cent crude fibre, 0.47 per cent phosphorus, 3.2 per cent potassium, 0.84 per cent iron, 2.48 per cent calcium and 1.35 per cent magnesium.

TABLE 106. Performance of culture A 83 Amaranthus

Year and season				Culture A 83 (yield in kg/ha)	Local variety (yield in kg/ha)
A.	Tamil Nadu Agricultural University Campus, Coimbatore				
	Summer	1977	(February-April)	39,630	18,980
	Monsoon	1977	(June - August)	38,780	19,880
	Summer,	1978	(March - May)	37,870	20,350
	Monsoon	1978	(July - September)	37,115	20,585
	Summer,	1979	(February - April)	38,340	19,150
	Mean		–	38,348	19,949
	Per cent increase over local			91.7	—
B.	Mean yield at Tamil Nadu Agricultural University Research Station			27,958	19,320
	Per cent increase over local			44.7	—
C.	Mean yield at Farmers holdings			25,843	19.023
	Per cent increase over local			35.3	–
D.	Overall mean yield			30,716	19,431
	Per cent increase over local			58.0	–
E.	Per day production (kg/ha)			341	216

Co 1 Radish: The selection RS 44-2-1 identified as promising out of 56 accessions and tested for six seasons during the period from 1977 to 1980 is released as Co 1 Radish. The crop duration was only 40 days and yielded on an average 21.98 tonnes of roots recording 21 per cent increase over the local type (Table 107). Roots are medium sized (226 g), long (22 cm) and thick (13 cm). Roots contain 10.9 mg of Vitamin C per 100 g and 1.28 per cent of crude fibre. Roots are less pungent and

has better consumers preference. The selection is suitable for cultivation throughout the year. Plants flower and set seed profusely in the plains. (Plate 32).

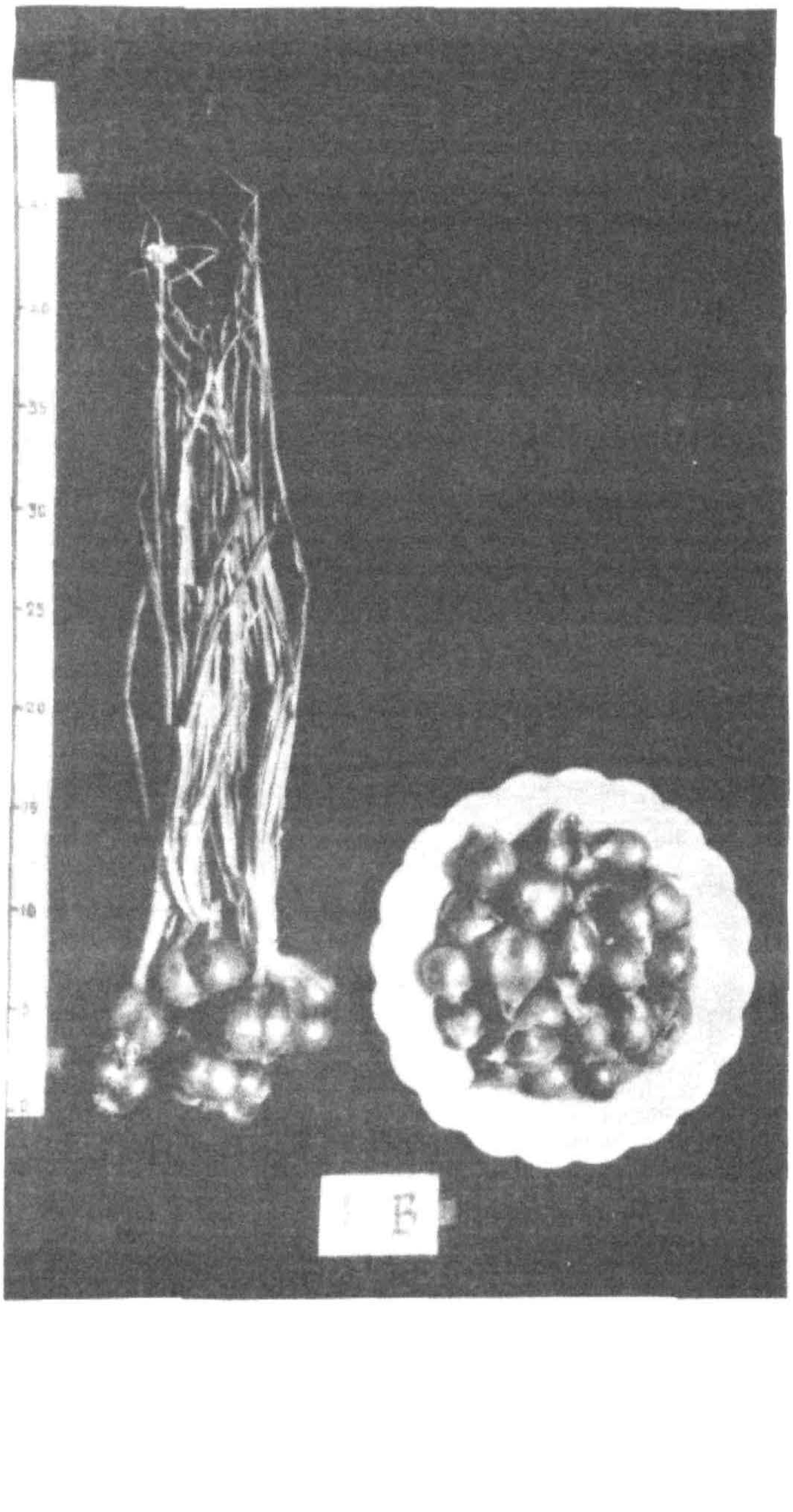
TABLE 107. Performance of RS 44-2-1 (Yield in t/ha)

Season and year	RS 44-2-1	Local
A. Tamil Nadu Agricultural University Campus, Coimbatore		
Summer 1977	19.7	17.6
Summer 1978	22.7	20.3
Winter 1978	25.4	15.4
Monsoon 1979	15.5	9.5
Monsoon 1979	22.0	13.6
Winter 1979	28.8	19.8
Mean of 6 seasons	22.35	16.13
Percent increase on local	+ 39.13	—
CD (P = 0.05)	6.03	
B. Mean yield at Tamil Nadu Agrl. University Research Stations	22.24	20.34
Per cent increase	+ 9.34	
CD (P = 0.05)	2.28	
C. Mean yield at Farmers holdings	21.37	18.21
Per cent increase	+ 9.73	
CD (P = 0.05)	1.33	
D. Overall mean yield	21.98	18.21
Per cent increase	+ 20 70	—

Ash gourd : Under the crop improvement programme, a promising selection BH 34 has been identified. The plants are less spreading in habit and suited to home gardens. The fruits are attractive and small sized with mean weight of 2.5 to 3.0 kg. It yields on an average 38.7 tonnes per hectare accounting for 24.4% increase over Co 1. The crop duration is 120 days. The selection is under pre-release stage.

Onion : A hybrid Onion derived from a cross between AC 885 and Co 3. This hybrid was tested for two years and compared with Co 3 onion. The hybrid performs well both in summer and winter seasons. The crop duration is 60-65 days. The plant height is 43.5 cm. The bulbs are bold in size (8.9 cm in girth and 3.8 cm in length) with attractive pink colour. The number of bulbs per clump ranges from 6 to 9 weighing on an

Plate 33 HYBRID ONION



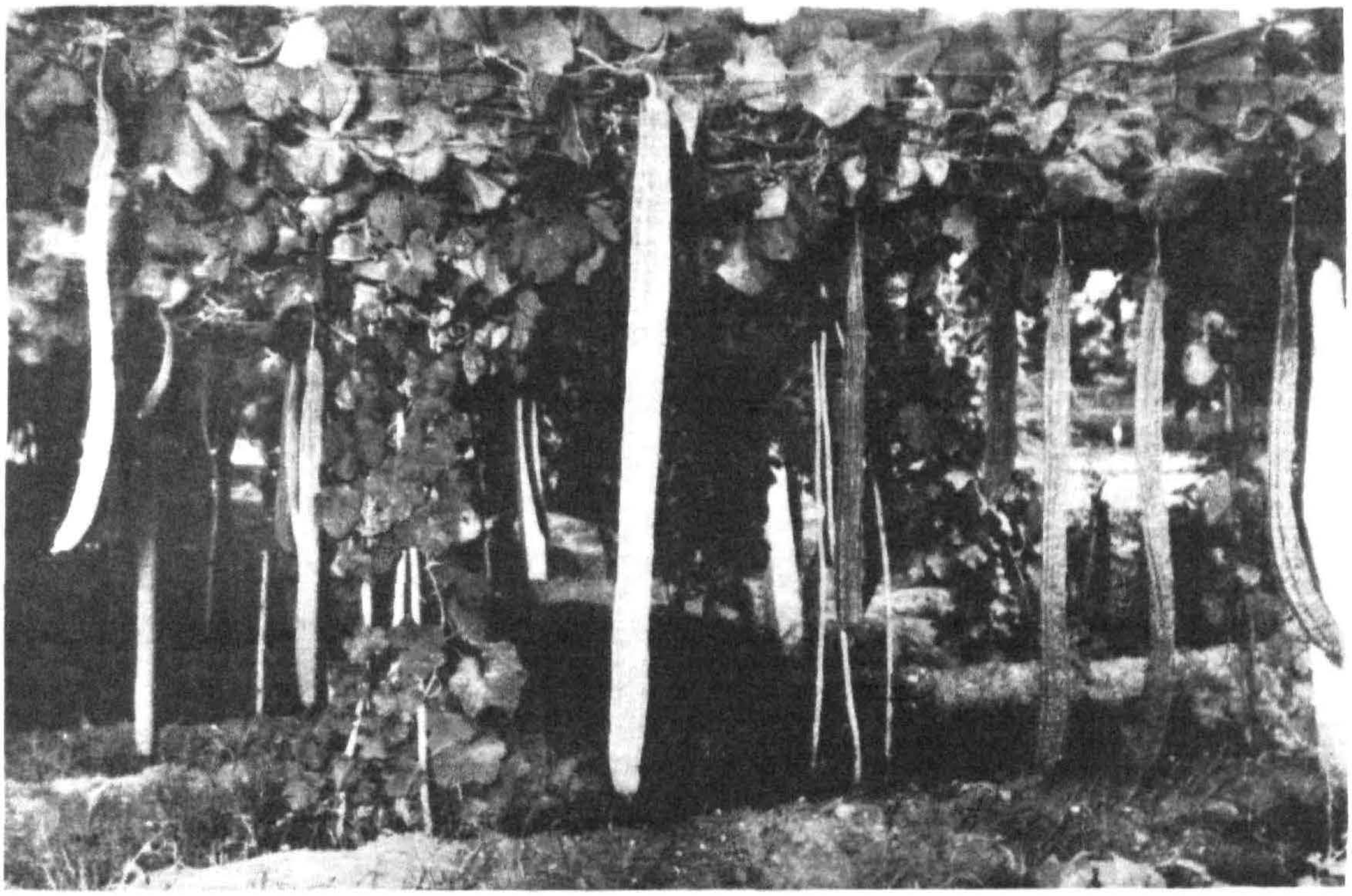


Plate : 34 CULTURE LA 11 RIBBED GOURD

average 120 g. This hybrid yielded 19.00 of bulbs/ha recording an increase of 22 per cent over Co 3 onion. (Plate 33).

Ribbed gourd : Selection programme has resulted in the isolation of a culture LA 11 from a local type. The fruits are very long (115 to 130 cm) and slender (girth 15 cm). The fruit is green in colour with ribs on its surface. Each plant produces on an average 8 to 10 fruits weighing 9 to 10 kg. The flesh content is more with less seeds. The edible quality of fruits is good having better consumer's appeal. It has a crop duration of 120 - 125 days. The fruits reach the edible maturity within 11-14 days of flowering. The first harvest can be taken in 70 days after sowing. (Plate 34).

Snakegourd : With an objective of improving the yield of snake-gourd through hybrid seed production, crosses were made, using the parental combination Panri Pudal (P) x Selection (S 1) and also its reciprocal.

TABLE 108. Performance of F_1 progenies and parents

Parents and F_1 progeny	Mean number of fruits/hill	Mean weight of fruits/hill (kg)	Mean length of fruit (cm)	Mean circum-ferance of fruit (cm)
Panri Pudal (P)	12.40	3.63	41.58	15.78
Selection 1 (S 1)	12.50	6.29	91.68	17.25
P x S 1	13.00	7.15	65.38	18.62
S 1 x P	12.10	6.81	75.72	18.23

F_1 progeny obtained from the P x S 1 registered the highest yield which was 13.5 per cent higher than S 1 and 50.0 percent higher than Panri Pudal. The fruits obtained from the F_1 progeny were of medium length and stouter than either parents (Table 108).

Cauliflower : The variety Early Synthetic has been found promising and suitable for growing in the plains. It performs equally well both in winter and summer seasons. The curd weight on an average ranges from 500 to 750 g. It yields on an average 22 tonnes per hectare. (Plate 35).

PLATE 35. Cauliflower for Plains

Varietial evaluation of Cauliflower suited to Kodai hills : The variety Super Snowball recorded the highest curd yield. Among, the forty varieties studied, twenty varieties bolted prematurely. Super snowball recorded higher curd yield of 440.0 g/plant which amount to an hectare yield of 24.40 tonnes. The variety snowball is recommended for cultivation. (Table 109).

TABLE 109. Varietal evaluation - Yield performance of Cauliflower varieties

Variety	No. of leaves	Lenght of curd (cm)	Breadth of curd (cm)	Yield of curds/plant (g)
Super Snowball	24.00	15.00	12.00	440.00
Snowball - 16	20.33	3.83	13.33	380.00
Early Snowball	22.00	12.00	11.00	290.00
Snowball	16.00	11.50	11.00	180.00
Late Snowball	18.00	8.19	7.70	165.00
Punjab Giant - 35	15.00	10.67	10.00	160.00

Cabbage

Varietal evaluation on Cabbage suited to Kodai hills : Among tha thirty four varieties, the variety September was adjudged as the best variety recording a mean head weight of 1.961 kg and hectare yield of 576.75 quintals followed by Succession and Glory recording 1.651 kg and 485.58 quintals and 1.617 kg and 475.58 quintals respectively. (Table 110). All the varieties matured in 124-160 days except Red Drum Head (180 days).

TABLE 110. Yield Performance of Cabbage varieties in Kodai hills

Variety	Duration (days)	Mean weight per head (kg)	Percentage of marketable heads	Yield of heads/ha (Q)
September	160	1.961	48.72	576.75
Succession	150	1.651	59.52	482.58
Glory	160	1.617	59.09	475.58
K.K. Cross (F_1)	138	0.764	76.09	224.70
Earliest Large Solid Drum Lead	150	0.946	68.25	278.23
Wisconsin All season	150	0.925	55.00	272.05
Premium Flat Dutch	160	0.817	52.94	240.25

* The Yield performance of the remaining are lower than 240 Qls/ha

Peas

Varietal evaluation suited to Kodai hills : Among the fifty three varieties the variety Superlaska recorded the highest yield of 51.65 g per plant with a calculated hectare yield of 17.19 tonnes (Table 111) followed by G C 447 (51.24 g/plant and 17.06 t/ha) and 88-2-C (50.98 g/plant and 16.98 t/ha).

TABLE 111. Yield performance of Peas in Kodai Hill

Variety	No. of Pods/plant	weight of pods/plant
Superlaska	11.69	51.62
G C 477	10.94	51.24
88 - 2 - C	8.19	50.98
G C 322	8.38	47.80
Early Giant	6.75	45.42
B. V.	7.44	45.08
Sel. 35	8.13	43.17
GL 66	8.50	42.25
KS 123	8.63	42.20
KS 126	8.38	41 06

* Yield performance of the remaining are less than 40 g/plant and not furnished.

Crop Management

Growth and development of Amaranthus : Investigations on the growth and development of nineteen types of amaranthus including leafy and grain types, A 144 continued to record higher green yield at all stages of growth followed by A 104 and A 56. Based on the nutrient status and palatability, Co 1 and A 66 are recommended for harvesting around 25th day after sowing, while the types Co 2, A 9, A 33, A 42, A 56, A 62, A 90, A 117, A 144, A 145 and A 153 between 25th and 30th days and remaining types viz , A 53, A 83, A 102, A 104, A 197 and A 111 around 30th day of sowing.

Growth and development of Onion : The growth parameters were studied at seven stages of the development of Onion crop during summer and winter seasons. In general, the vigour and bio - chemical constituents of plants grown during summer were greater than the plants raised during winter. The bulbs treated with MH at 1500 ppm as pre-harvest spray on the 50th day after planting and storing at 30 C and 67 per cent R. H. was effective in controlling loss through sprouting, rotting and rooting during storage. MH - treatment decreased the synthesis of nucleic saids, activity of enzymes and endogenous growth promotors and increased the activity of inhibitors.

Soil Management

Sugar factory distillery effluent on onion : The effect of irrigating the Co 3 onion crop with different concentrations of the sugar factory distillery effluent with and without the recommended fertilizer application was studied. The growth of the crop, yield and quality of bulbs were found to be superior in plants irrigated with five per cent effluent. At higher concentrations these traits were affected. It was observed that the irrigation of Onion with 5% effluent gave higher yield than the crop raised with normal recommended fertilization. However, application of effluent at five per cent in combination with recommended fertilisers improved the yield and quality than the application of effluent alone. The study indicates the possibility of utilising the sugar factory distillery effluent for irrigation and fertilisation in the cultivation of onion.

Poassium fertilisation in Tapioca : Fertilizer experiments on Tapioca conducted during the year 1980 at Coimbatore, Bhavanisagar, Kaveripattinam & Pondichery centres have indicated that the application of 120 kg K_2O/ha influenced the tubers to achieve highest starch content irrespective of the N levels as well as varieties tried. (Table 112).

TABLE 112. Effect of N and K on the starch content of Tapioca

Crop and Variety	Tapioca - H 2304	Tapioca	Tapioca - H 2304	Tapioca - Asoka
Centre	Coimbatore	Kaveripattinam	Bhavanisagar	Pondicherry
Treatment	Starch content per cent	Starch content per cent	Starch content per cent	Starch content per cent
N_{80} K_0	62.23	68.13	70.25	65.63
K_{40}	70.50	75.63	76.00	75.63
K_{80}	76.00	81.25	80.50	81.25
K_{120}	80.75	84.38	84.75	83.75
N_{120} K_0	61.50	62.50	63.25	62.50
K_{60}	67.00	69.38	72.00	70.63
K_{120}	80.00	83.75	80.50	83.13
K_{180}	72.50	80.00	74.50	77.50
S. E. of mean	1.42	1.16	0.75	0.94
C. D. at 5%	4.19	3.40	2.21	2.77

NPK Trials on French beans : The effect of N, P and K each at three different levels 0, 50, 100 kg/ha with all possible combinations on French beans Cv. 'Premier' was studied to find out the optimum nutrient requirements of the crop. Growth and yield were significantly increased with the increase in the levels of the nutrients. Among the three nutrients, phosphorus brought out greater response for growth and development and yield of the crop. The fertilizer treatment $N_1 P_2 K_1$ (50 : 100 : 50 kg/ha) proved to be superior in respect of earliness and higher pod yield. The same dosage of nutrients produced pods of better quality. The uptake of N, P and K by plants was increased with the application of increased doses of respective nutrients. The total uptake in respect of $N_1 P_2 K_1$ combination was 53.295 kg of N, 7.777 kg of P_2O_5 and 70.146 kg of K_2O/ha. The highest yield and total return were obtained from the treatment $N_1P_2K_1$ (50 : 100 : 50 kg/ha)

Effect of *Azospirillum* inoculation on the yield of Amaranthus: A field trial was conducted at Coimbatore to assess the performance of *Azospirillum* on the grain and leafy types of amaranthus. The results indicated that the growth and yield of leafy and grain types of amaranthus significantly increased due to *Azospirillum* inoculation. Both the greens

and grain yields of amaranthus supplied with 50 kg N/ha along with inoculation was on par with that of 75 kg N/ha without *Azospirillum* inoculation indicating that *Azospirillum* inoculation can substitute 25% fertilizer nitrogen (Table 113).

TABLE 113. Effect of ***Azospirillum*** inoculation on the green matter and grain yields of Amaranthus under graded levels of fertilizer nitrogen

Cultivars	25 kg N/ha		50 kg N/ha		75 kg N/ha	
	Control	Inoculated	Control	Inoculated	Control	Inoculated
I. **Green matter yield** (Kg/m^2)						
A. dubius (leafy type)	0.97	1.30	1.52	2.29	2.09	2.44
A. gangeticus (leafy type)	1.42	1.87	1.92	2.68	2.78	2.50
A. hypochondriacus (grain type)	1.56	1.96	2.04	2.73	2.90	3.05
A. edulis (graintype)	1.56	2.212	2.17	3.10	3.28	3.17
II. **Grain yield** (g/m^2)						
A. dubius	30.4	51.8	44.6	57.2	55.0	56.8
A. gangeticus	144.0	176.0	208.0	252.0	256.0	264.0
A. hypochordriacus	218.0	260.0	264 0	340.0	334.0	322.0
A. edulis	180.0	196.0	236.0	296.0	288.0	300 0

Evaluation of genotype of Amaranthus for nitrogenase activity in the rhizosphere : The rhizosphere soil samble of 83 germplasm collections of *Amaranthus* were analysed for the nitrogenase activity at 30th and 40th day after sowing. The maximum nitrogenase activity was recorded at 30th day after sowing. There were lot of variations between the genotypes and stages of crop growth for the nitrogenase activity. *A. gangeticus* (A. 25 and A.27) had registered the highest nitrogenase activity when compared to other genotypes of *Amaranthus*.

Crop Protection

Pest Management in Bhendi : Application of aldicarb (Temik) granules at 0.75 kg ai/ha 10th days after sowing, followed by three sprayings with either endosulfan 0.07% or monocrotophos 0.1% at 10 days interval starting from 40 days after germination effectively controlled the bhendi fruit borer (Table 114).

TABLE 114. Efficacy of different insecticides in the control of fruit borer

Treatment	Fruit borer infestation %	Yield (kg/plot)
Sevithion 50% WP 0.1%	0.15 (6.97)	9.396
Sevimol 40% WP 0.1%	1.23 (6.23)	8.723
Gardona 50% WP 0.1%	2.23 (8.53)	9.307
Orthene 70% WP 0.7 kg ai/acre	1.30 (6.55)	9.280
Monocrotophos 0.1%	1.13 (6.10)	9.766
Endosulfan 0.07%	0.93 (5.53)	8.060
Dursban 40 EC (Pyrophos) 0.1%	1.53 (7.08)	9.097
Dimethoate (Rogor 30 EC) 0.03%	1.40 (6.73)	8.813
Chlorfenvinphos (Birlane 24 EC 0.5 kg ai/ha	1.77 (7.63)	7.713
Control (with disulfoton granules)	6.90 (15.20)	6.403
Control (without granules)	15.46 (23.11)	1.593
CD	1.77	2.102

(Figures in parentheses are transformed values)

Among the synthetic pyrethroids, fenvalerate (Sumicidin) 0.01%, fenpropathrin (Meothrin) 0.01%, permethrin (Ambush) 0.01% and cypermethrin (Ambush) 0.01% and cypermethrin (Ripcord) 0 01% were effective n reducing the infestation by fruitborer as assessed from the weight of the fruits. Fenpropathrin treatment resulted in reduced mites while treatment with bendiocarb 0.01% showed high incidence of mites (Table 115). All the treatments with synthetic pyrethroids resulted in high incidence of powdery mildew disease.

Studies on the host-resistance in bhendi to the leafhopper *Amrasca devastans* indicated that the mechanism of resistance in bhendi varieties comprised of non-preference and antibiosis. The resistant variety, A E 22 was less preferred for oviposition because of its hairiness on the midrib and lamina. The non-preference of this variety for feeding was because of its inadequate nutrient status. The multiplication of the leafhopper was

also poor in this variety. The inadequate concentration of sugars, amino-acids, organic acids and minerals together with higher fractions of toxic phenols were responsible for high antibiosis.

Sixty two varieties of bhendi were screened under field and pot culture conditions for resistance to red spider mite, *Tetranychus telarius* and the variety Clemson Spineless was identified as resistant.

TABLE 115. *Effect of synthetic pyrethroids and other new formulations on the control of bhendi fruitborer*

Treatments	Infested fruits (%) Number	Infested fruits (%) Weight	Yield of healthy fruits (kg/ha)	Mites (No. / cm^2)
Control	46.73 (43.09)*	25.42 (29.67)*	673	49.88
Fenvalerate 0.005%	9.26 (17.47)	5.11 (12.47)	3323	9.23
Permethrin 0.01%	3.37 (10.50)	1.23 (6.28)	4117	13.65 1.17
Decamethrin 0.001%	7.82 (15.93)	2.72 (9.36)	3515	24.68 1.36
Fenpropathrin 0.01%	3.8 (11.19)	1.41 (6.76)	4605	1.50 0.54
U. C. 51762 0.01%	11.0 (19.06)	5.51 (13.37)	2729	38.10 1.54
Bhendiocarb 0.1%	17.10 (24.36)	7.12 (15.48)	2316	41.76 1.59
Endosulfan 0.05%	15.0 (22.59)	6.73 (14.86)	3002	20.50 1.27
FMC Carbofuran 0.05%	19.89 (26.46)	10.45 (18.83)	2288	35.05 1.55
Cypermethrin 0.01%	7.05 (15.03)	2.62 (8.97)	3857	8.96 1.01
CD	3.64	3.28	81.67	0.41

* Figures in Parenthesis are arcsine transformed values

** Figures are (log (x + 2) transformed values.

Pest Management in Brinjal : The synthetic pyrethroids, decamethrin, cypermethrin, fenvalerate and permethrin were effective in controlling the fruit borer infestation and among them spraying with decamethrin 0.005% resulted minimum fruit borer damage both on number and weight basis followed by decamethrin 0.0025%. Spraying with decamethrin 0.005% led to the harvest of 20,375 kg/ha of uninfested fruits as compared to 4290 kg/ha recorded in unprotected plot (Table 116).

TABLE 116. Control of Brinjal fruit borer (*Leucinodes orbonalis*) with synthetic pyrethroids and the yield of fruits

Treatments	Fruit borer infestation		Yield	Yield
	By number	By weight	(kg/Plot)	(kg/ha)
Sevimol 01%	58.87 (50.15)	56.29 (48.67)	14.48	7240
Cypermethrin 0.05%	24.98 (29.87)	22.82 (28.41)	32.62	16310
Cypermethrin 0.0025%	41.60 (40.11)	38.46 (38.25)	19.35	9675
Decamethrin (Decis) 0.005%	9.50 (17.85)	7.76 (16.12)	40.75	20375
Decamethrin (Decis) 0.0025%	15.41 (22.97)	14.00 (21.91)		
Decamethrin (Decis) 0.0 125%	27.08 (31.24)	28.76 (32.34)	26.02	13010
Fenvalerate 0.005%	25.87 (30.53)	23.47 (28.94)	28.42	14210
Fenvalerate 0.0025%	38.45 (38.32)	36.01 (36.71)	25.77	12885
Permethrin 0.005%	34.44 (35.91)	31.87 (34.33)	19.60	9800
Permethrin 0.0025%	45.79 (42.59)	42.79 (40.86)	17.64	8820
Fenpropathrin 0.005%	43.18 (41.07)	42.99 (40.93)	20.10	10050
Control	17.96 (57.46)	70.8 (57.38)	8.58	4290
CD	4.66	4.39	12.72	

Figures in parenthesis are transformed values.

Disease management

Tomato: Tomato seed samples collected from Tamil Nadu, Karnataka and Andhra Pradesh were infected with *Corynebacterium michiganense* and *Fusarium semitectum*. *C. michiganense* caused stem splitting, leaf spot and fruit rot and the infected seeds showed reduction

in germination and seedling vigour. *F. semitectum* caused wilting of plants and rotting of fruits. The fungus infected seeds showed reduction in germination and seedling vigour. Fruit infection by both the pathogens lead to seed infection. Among the several seed health testing techniques, seedling symptom test was most effective in detection of *C. michiganense* while 2, 4-D blotter technique was highly effective for *F. semitectum*. Soaking tomato seeds in terramycin (1000 ppm) for 1 h was highly effective in controlling *C. michiganense* while Bavistin and Difolatan 2 g/kg of seeds by slurry or soaking method eradicated *F. semitectum* from seeds.

The effect of insecticides in checking the spread of tomato leaf curl disease by controlling the insect vector was studied (Table 117).

TABLE 117. Incidence of leaf curl and *Alternaria* leaf spot

Treatment	Whitefly (T. V.)	Leafcurl (T. V.)	*Alternaria* leaf spot (T. V.)	Yield (kg/plot)
Carbofuran G 1.00 g a. i. / ha Monocrotophos 0.05%, Dithane M 45 0.1%	0.79	1.50	47.88	25.9
Carbofuran G 1.00 kg a. i. / ha Endosulfan 0.07%, Dithane M 45 0.2%	0.79	1.36	35.69	29.9
Aldicarb G 1 00 kg a. i. / ha Monocrotophos 0.05%, Dithane M 45 0.2%	0.79	0.91	38.22	27.5
Aldicarb G 1.00 kg a. i. / ha Endosulfan 0.07%, Dithane M 45 0.2%	0.75	0.71	36.73	42.8
Monocrotophos 0.05%, Dithane M 45 0.2%	0.84	1.41	45.00	17.5
Endosulfan 0.07%, Dithane M 45 0.2%	0.83	1.34	39.21	21.2
Monocrotophos 0.05%	0.87	1.64	54.99	15.7
Dithane M 45 0.2%	0.90	2.00	36.23	10.8
Untreated check	1.00	2.03	55.07	13.4
CD (P=0.05)	0.08	0.36	8.50	12.25

Among the treatments, the lowest incidence of whitefly, and leafcurl was recorded in the combined treatment of aldicarb, endosulfan and Dithane. The yield recorded in this treatment was also high to the extent of 219.4% over the untreated check. Drenching the nursery with dexon 0.025%, 15 days after sowing, followed by application of aldicarb granule at 1.0 kg a.i./ha, a week after planting and spraying with Dithane M 45 0.2% at 30 days after transplanting and Dithane + endosulfan 0.07% at 45 and 60

days after transplanting would be an effective combination in protecting tomato crop from major pests and diseases.

Brinjal : Brinjal seeds were infected with *Aspergillus flavus*, *A. niger*, *A. glaucus*, *Fusarium moniliforme* and *Helminthosporium tetramera* in storage. When the seeds were treated with six fungicides at 2 g/kg and stored in cloth bags for 24 months, the fungal flora were reduced appreciably. But none of them completely eliminated all the fungi. Among them, Bavistin was highly effective against *Aspergillus flavus*, *A. niger*, *A. glaucus* and *Fusarium moniliforme*. Bavistin + Thiram significantly reduced most of the fungal infection.

Bavistin, as well as Bavistin + Thiram controlled most of the fungi effectively and also preserved the viability and vigour of the seedlings significantly even after 24 months of storage (Table 118).

TABLE 118. Effect of seed treatment on brinjal seed germination and seedling vigour after 24 months of storage

Treatment	Seed germination (%)	Dry weight of seedling (mg)
Thiram	37	15
Captan	51	13
Bavistin	70	18
Bavistin + Thiram	69	21
Vitavax + Thiram	50	17
Difolatan	44	12
Untreated	28	10
C. D.	5	3

Bhendi : *Macrophomina phaseilina*, the root rot inciting pathogen and *Fusarium oxysporum*, the wilt inciting pathogen were detected in bhendi seeds. No seed treatment was effective in eradicating the pathogens in seed. Seeds collected from lower part of the plants yielded more fungi than those collected from upper part of the plants. Spotted boll-worm attack increased the incidence of these pathogens in seeds. Control of spotted boll-worms by pre-harvest spray with monocrotophos (Nuvacron) reduced the incidence of both the pathogens When Bavistin was sprayed along with monocrotophos the seeds were free from both the pathogen.

FLOWERS

Crop Improvement

Mullai *(Jasminum auriculatum)* **:** Screening Mullai selections resulted in identification of 12 distinct types. These twelve selections were tested and compared with the variety Parimullai.

Among them, the selections 'LR' and No. 24 recorded higher yield than Parimullai. Even though the selection 24 recorded high yield of 11302 kg per hectare, the flower bud characters are not encouraging and it has least consumer preference. The selection 'LR' has desirable flower bud characters like long corolla tube and bold bud. It recorded 8802 kg of flower buds while Parimullai gave only 7089 kg per hectare. The Jasmine concrete recovery in LR was 0.34% while it was 0.29% in Parimullai. It has better consumer preference than Parimullai due to its bolder bud and longer corolla tube. This selection was released as CO 1 Mullai. (Plate 36).

The flower bud characters of CO 1 and Parimullai are furnished in Table 119.

TABLE 119. Flower bud characters of CO 1 and Parimullai

Characters	CO 1	Parimullai
Total flower bud length (cm)	2.40	2.29
Corolla tube length (cm)	1.50	1.30
Bud length (cm)	0.90	0.99
Bud diameter (cm)	0.50	0.38
Petal length (cm)	1.00	0.65
Petal width (cm)	0.59	0.32
Weight of 100 flower buds (g)	8.8	6.2

Interspecific hybridization did not result in the successful production of hybrids. Inter-clonal hybridization was successful and a number of hybrids with long corolla tube and bold bud characters were evolved and their yield potentiality is being assessed. Among the Mullai hybrids, one hybrid No 45 resulted from mutant parent P_1 and the seedling No. 16 recorded high yield of 4.725 kg whereas the parents yielded only 2.135 kg and 2.187 kg of flower buds respectively. The study of performance of hybrids is continued. Five nodal succulent cuttings of CO 1 Mullai were irradiated with gamma 1.0, 1.5 and 2.0 kr and planted in the mist chamber for rooting. Seeds of CO 1 Mullai were irradiated with gamma rays 2.5, 5 0, 7.5 and 10.0 kr and sown in pots.

Plate: 36 CO1 MULLAI

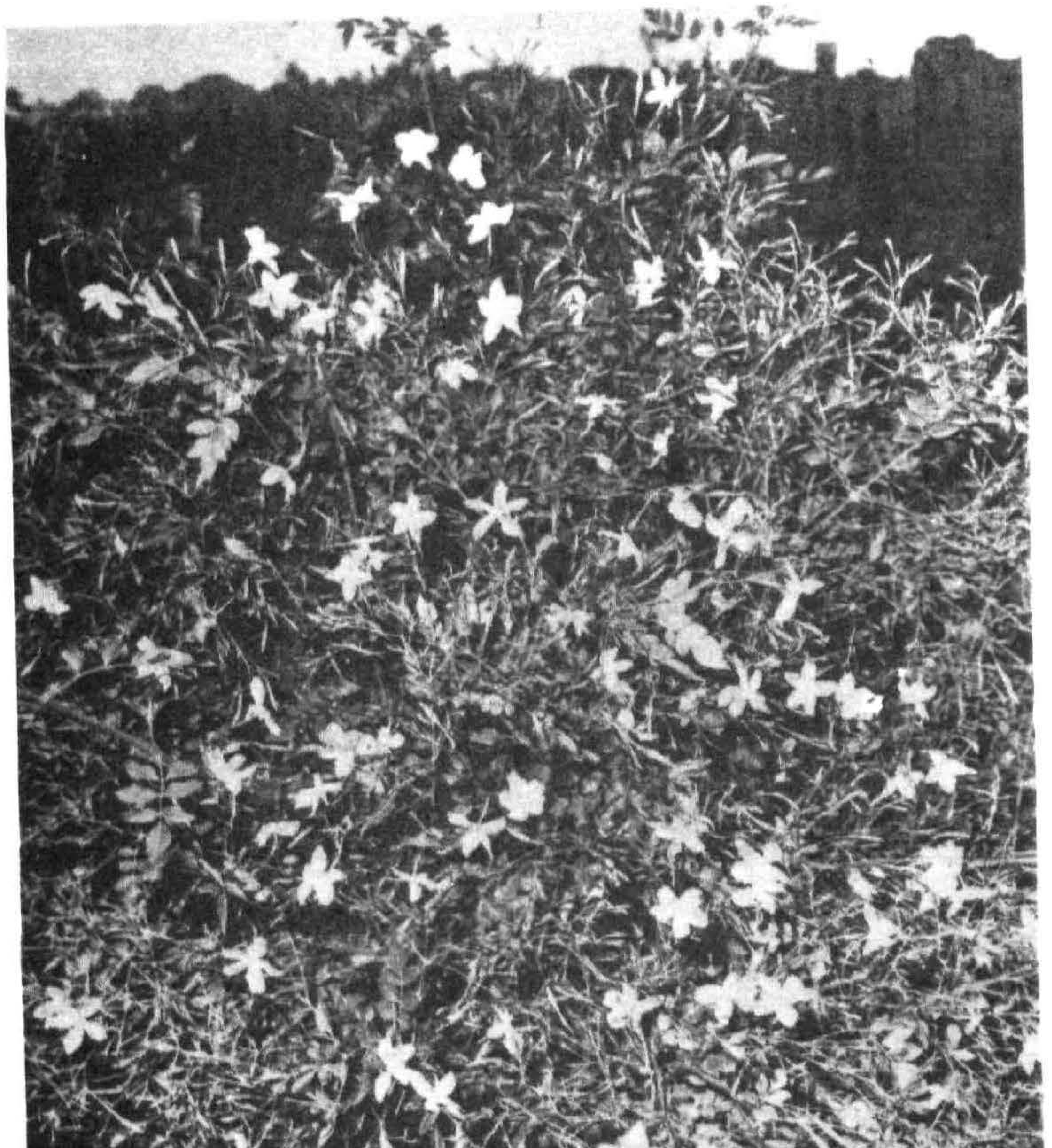


Plate: 37 CO1 PITCHI

Jathimalli *(Jasminum grandiflorum* L.*)*

Concerted efforts in screening of Jathimalli selections, resulted in identification of six distinct clones of which five are diploids and one is a triploid. The flower buds of triploid and four diploids are pinkish in colour and one diploid is having white flower bud. These morphologically distinct clones were evaluated for their yield of fresh flower bud and jasmine concrete recovery.

Among six clones, JG 3 gave high yield of 10152 kg of flowers per hectare and a calculated jasmine concrete yield of 29 42 kg/ha, while JG 4, a white Jathimalli laregely cultivated in Tamil Nadu gave 6276 kg of flower buds and a calculated jasmine concrete yield of 17.58 kg per ha. The clone JG 3 can be grown for fresh flower market as well as for jasmine oil industry. This selection was released as CO 1 Pitchi. (Plate 37).

Chrysanthemum

In the varietal trial, five commercial varieties were tested for their yield of flowers. The variety, Golden Yellow Red Base gave a maximum yield of 28177 kg of flowers followed by the variety Megami with 22131 kg of flowers per hectare. The variety Megami with big sized attractive pink colours combined with good keeping quality find preference in the market over Golden Yellow Red Base which has poor keeping quality. Among fifty four varieties of garden chrysanthemum introduced from Lucknow, Sharad Probha and Sharad Snoba have attractive flowers with early flowering.

Hibiscus

'Thilagam' and 'Punnagai' : A number of intergeneric, inter-specific and intervarietal hybrids were made. An intergeneric hybrid No. 20, a cross between *Hibiscus rosa-sinensis* and *Malvaviscus arboreus* was found promising with multiple petals and deep carmine-red coloured flowers. All petals are fully open and arranged in three whorls. The flowers with their small petals and inconspicuous stamen and pistil look like red rose from a distance. It produced on an average 3003 flowers per plant per year. This variety has been released as 'Thilagam'. (Plate 38).

Another variety (HS 44) selected from open pollinated seedlings of the popular variety Chandrika was found promising. This variety has large sized apricot yellow flower, with crape paper like texture of the petals and attractive signal red throat. It yielded 988 flowers per year per plant while the mother plant Chandrikagaree, only 380 flowers. This variety was released as 'Punnagai'. (Plate 39).

Rose

Edward rose, the commonly cultivated variety has poor keeping quality. The petals shed within hours after picking. In order to improve the keeping quality of Edward rose, reciprocal crosses have been made between Edward rose, and Red rose which is noted for its petal retention character. Hybrid seeds are sown for further observations.

Agrotechniques

Irrigation - Fertilizer Trials : A trial with four levels of irrigation *viz.*, permanat wilting point, 20, 40, and 60% available moisture with two levels of fertilizers such as NPK at 60 : 120 : 120 g + 15 kg of FYM and NPK at 120 : 240 : 240 g + 30 kg of FYM was laid out in an existing field of five year old plants. Irrigating the plots at 20% available moisture under NPK at 120 : 240 : 240 g along with 30 kg of FYM recorded the highest yield of 2.712 kg of flower buds per plant, while the normal practice of irrigating once a week with same level of nutrition has given an yield of only 2.399 kg per plant. The study is in progress for confirmation of the results.

Processing Jasmines : The recovery of jasmine concrete from all the available species and varieties have been assessed. Among *Jasminum auriculatum* clones the selection 24 recorded the highest percentage of concrete recovery (0.39%). In *Jasminum grandiflorum* the variety CO 1 Pitchi recorded the highest concrete recovery of 0.29% which was closely followed by the clone Thimmapuram with 0.27%. In *Jasmiuum sambac*, the variety, Gundumalli gave 0.15% of concrete. Among the less familiar species, *Jasminum angustifolium* recorded highest concrete recovery of 0.35%, but this species is a very poor yielder and hence not suitable for commercial cultivation. *Jasminum flexile* gave 0.22% of concrete recovery. Though many of the species were found to yield satisfactory yield of concrete, at present there is market only for the concrete obtained from *Jasminum grandiflorum* flowers. The concretes of *Jasminum auriculatum* and *Jasminum sambac* are not finding favour in the world market The potentiality of less known species with high concrete recovery percentage can be utilised in the breeding programme for improvement of Jasmines.

The concrete of *Jasminum auriculatum* and *Jasminum grandiflorum* was analysed for their physical properties and found that *Jasminum auriculatum* concrete recorded higher melting point (53 - 54°C), high acid value (19.43) and low Ester value (73.63) than *Jasminum grandiflorum* (48-50 C, 11.74 and 126.70 respectively).

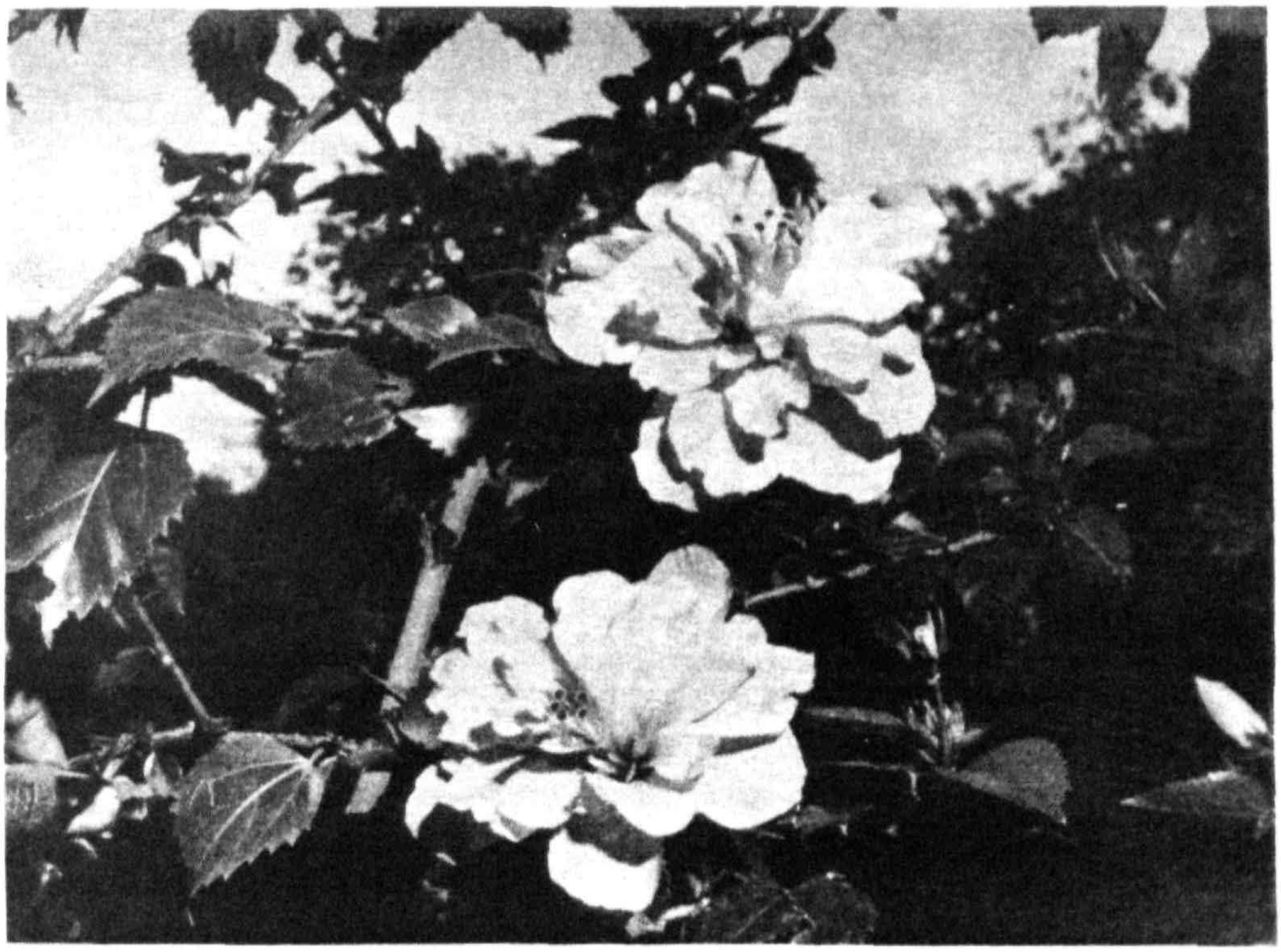
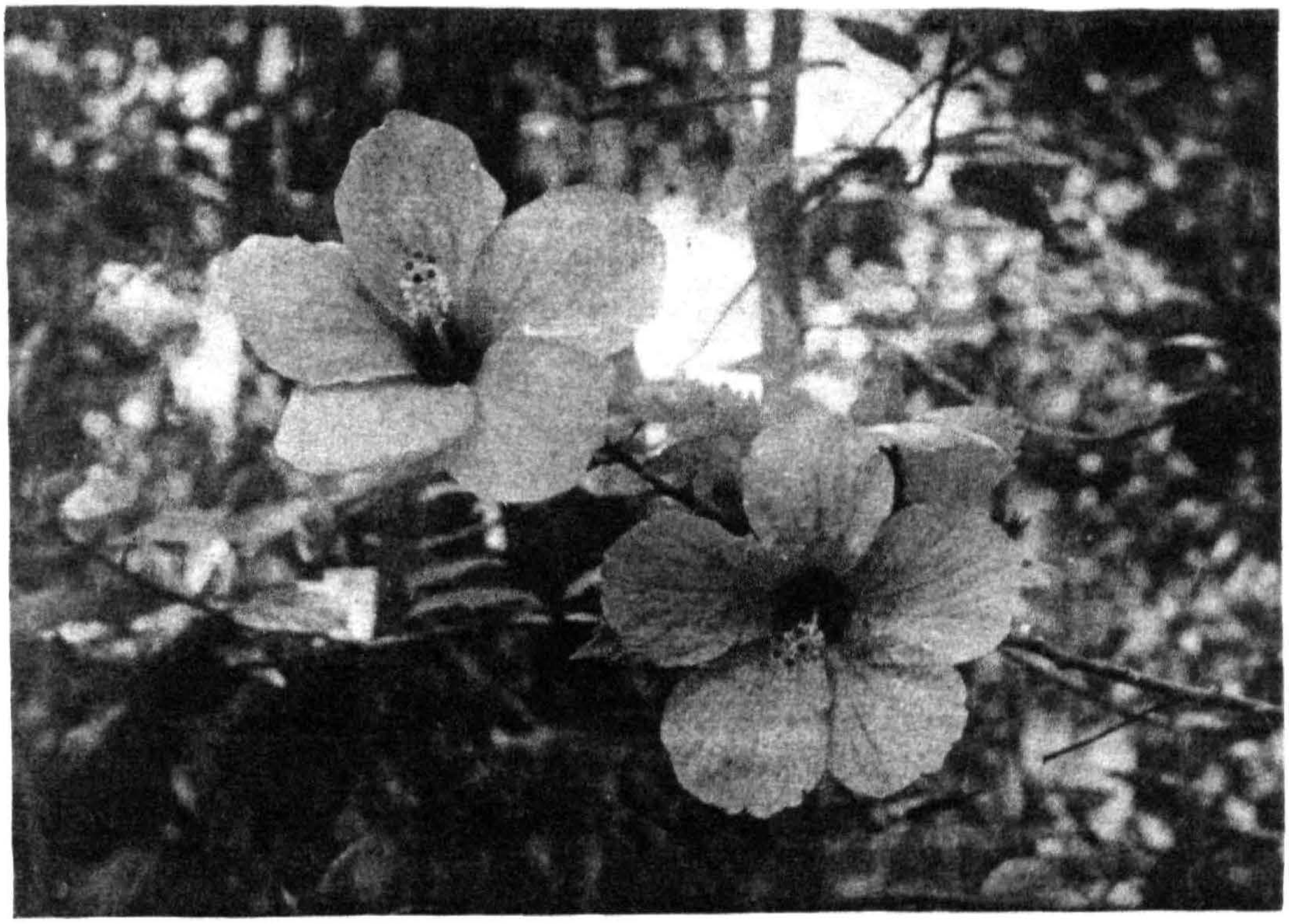


Plate: 38 'THILAGAM' Hibiscus

Plate: 39 'PUNNAGAI' Hibiscus



Standardisation of solvent: Food grade Hexane, perfumary grade Hexane, Petroleum ether and carbon tetra chloride were tried as solvents and food grade Hexane (BP 60-80) was found to be suitable. Perfumery grade Hexane though more suitable, is prohibitively costly. Laboratory purification of food grade hexane to the degree of perfumery grade was also costly and worked out to be Rs. 40 per litre. Carbon tetra chloride gave better and quicker extraction than food grade Hexane, but owing to higher cost it could not be used in large scale extraction of floral concrete. Petroleum ether was not only costly but also highly inflamable and hence its use in concrete extraction is limited. For rotary type of extractor the solvent required per kilogram of flowers is 2 litres while in the case of static type of extractors, the solvent repuirement is 4 to 5 litres per kilogram of flowers.

Time for Picking flowers: To find out the optimum time at which the flowers have to be picked for obtaining maximum concrete recovery, the flowers of *Jasminum grandiflorum* were picked at different timings viz., 6.30 to 7.30 a.m , 8 to 8.30 a.m. 9 to 9.15 a.m., 10 to 10.15 a.m. and 11 to 11.15 a.m. and found that the flowers picked between 9 to 9.15 a.m. recorded the highest concrete recovery of 0.315%.

Yield of concrete during different parts of the year: The yield of jasmine concrete recovery was also found to vary among months depending upon the climatic conditions. The percentage of concrete recovery was high during the period of peak flower production from July to September.

Economics of Jasmine concrete production: In order to assess the economics, a study was carried with *Jasminum grandiflorum*. The total expenditure for the production of 8500 kg flowers for fresh flower market worked out to Rs. 29.085. By disposing the flower at Rs. 5/kg an amount of Rs. 42,500 can be realised as gross income. The net income per hectare will be Rs. 13,415.

For the production of jasmine concrete, in addition to the cultivation expenditure of Rs. 30,035 to get an yield of 8975 kg open flowers, the cost of processing the flowers amounting to Rs. 37,684 has to be included. A total of Rs. 67,719 has to be incurred for the production and processing of 8,975 kg of flower for extracting 22.44 kg of jasmine concrete. By disposing 22.44 kg of Jasmine concrete at the present

The application of P showed significant increase in the yield attributes. P at 50 kg/ha increased the fresh weight of whole plant, fresh and dry weight of leaves and also fresh and dry weight of roots. The interaction effect of N x P was not significant.

In short, to increase the yield of *Catharanthus roseus*, irrigation at weekly intervals and application of N at 100 kg and P at 50 kg will be optimum.

SPICES AND PLANTATION CROPS

Crop Improvement

Cashewnut : As a result of the comprehensive evaluation carried out with over four hundred and sixtyfive seedling progenies of selected cashew types, at the Cashew Research Station, Vriddhachalam, one superior cashew selection, M 10/4, characterised by high yield of nuts as well as high quality kernels has been released as VRI 1 cashew. The improved selection has recorded a mean yield of 7.12 kg of nuts per tree per annum as against the State average yield of only 0.600 kg/tree/annum. The nuts are large sized weighing 5.0 g and the kernels are bold and attractive and conform to 240 W count, a top grade in international cashew trade. (Plate 40).

Turmeric : A mutant 5307-1-1 was isolated from the progenies resulted from 5 KR X-ray irradiation of Erode local. This mutant selection yields 5.24 tonnes of dry turmeric per hectare in 285 days, recording an increase of 13.9% over the parent Erode local

Coriander : A pure line selection with high yielding potentiality was isolated. This selection yielded 7938 kg of grains/hectare accounting an increase of 22.6% over Co 1. This selection is expected to give an for additional income of Rs. 590/ha over Co 1 coriander.

Chillies : Selection programme was intensified in gundu type chilli and has resulted in the isolation of a culture CA(P) 63. It is a selection from a local gundu type This selection gives a mean yield of 2200 kg of dry pods per hectare accounting for an increase of 39% over the already released gundu variety Andhra Jothi from Andhra Pradesh. It is suitable for cultivation both in monsoon and summer seasons. It adapts well for a closer spacing of 30 x 30 cm. The fruit matures in 135 days after sowing The pods are short (4.1 cm long) and stout (5.1 cm girth) with

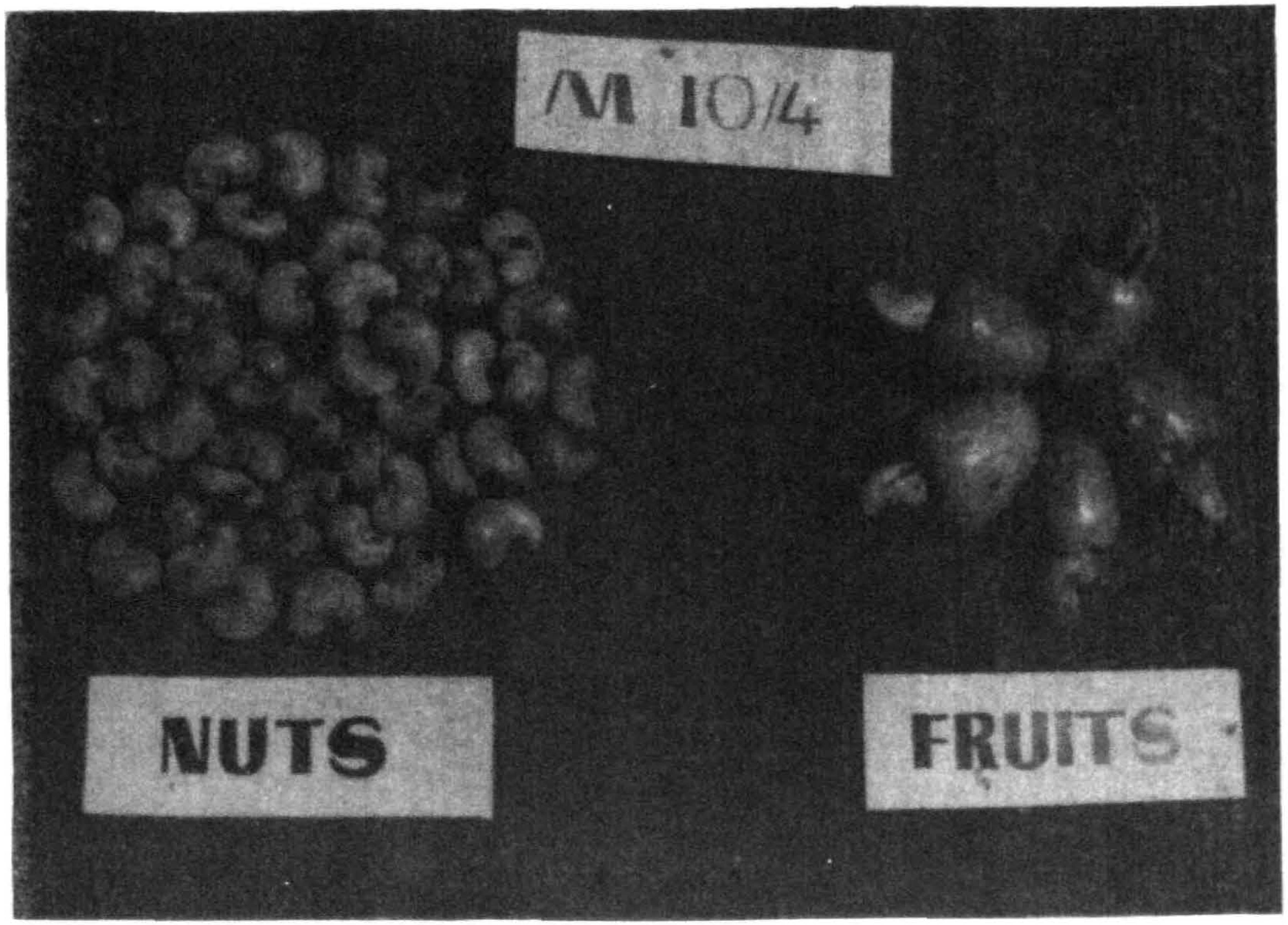


Plate: 40 VRI 1 CASHEW

attractive bright red colour. The seed content is high (50%). The capsaicin content of green and dry pods is 0.38 and 0.56% respectively. The selection is under pre-release testing.

Fenugreek : The fenugreek type TG 2336 selected from an IARI accession recorded the highest grain yield of 684.5 kg per hectare and is found suitable for cultivation in all parts of Tamil Nadu.

Crop Management

Turmeric : To enhance the rate of rhizome production for rapid multiplication of turmeric, split halves of mother rhizomes are found to be superior recording the highest quantity of rhizomes which is 10.1% higher than the conventional method. The next best treatment to increase the rate of rhizome production was spraying of 500 ppm CCC four times at monthly intervals commencing from second month upto fifth month which accounted for 8.4% higher quantity of rhizomes over the conventional method.

Mulching of turmeric with shelled maize cobs resulted in an increased yield of 44.90% over the conventional tillage and 50.84% over no tillage plots.

Planting of aggregate onion on the opposite side of the ridges in turmeric, fetches an additional income of Rs. 3491/ha over monocropping of turmeric.

Tapioca : Three budded setts were assessed to be the most economic planting material for tapioca planting, under Vridhachalam conditions. The crop raised with three budded cuttings registered a tuber yield of 22.99 tonnes/ha as against 24.°5 tonnes/ha of the crop raised by planting normal setts of six to eight buds.

Chicory : A closer spacing of 20 x 15 cm and application of 80 kg nitrogen, 75 kg P_2O_5 and 100 kg of K_2O per hectare is found optimum for higher yields in chicory.

Effect of season on oil content on geranium : The percentage of oil content in shoots showed that the content of oil was maximum in summer months while during the winter months the oil recovery was low. However the principal constitutent of the oil namely geraniol was not affected by the saason (Table 121).

TABLE 121. Effect of season on oil content of geranium

Month	Oil content %	Geraniol content
April	0.120	58.23
May	C.135	58.55
June	0.134	58.15
July	0.140	59.20
August	0.100	57.30
September	0.089	58.00
October	0.070	57.65
November	0.075	57.65
December	0 075	58.00

Rooting of geranium cuttings : Soil with pH 5.5 significantly registered the higest rooting of 75.0%. This was followed by the pH levels 6.5 and 4.5 with 50.8 and 50.2% of rooting. Lowest of 21.4% rooting was recorded in pH 3.5. The same soil pH (5.5) also registered the maximum number of roots (6.08) and length of roots (6.57 cm) as against the pH 3.5 recording 3.32 roots and 1.67 cm of root length (Table 122).

TABLE 122. Effect of soil pH on rooting per cent. number of roots and length of roots in geranium cuttings

pH	Rooting per cent		Numbet of roots		Length of roots	
	Basal	Middle	Basal	Middle	Basal	Middle
3.5	16.67	26.67	2.60	4.03	1.37	1.97
4.5	43.33	56.67	3.83	4.37	2.00	3.20
5.5	68.33	80 00	5.07	7.10	5.97	7.17
6.5	43.33	58.33	3.20	3.93	3.20	4.10
7.5	36 67	46.67	3.23	4.30	3.20	4.93
8 5	36.67	41.67	3.67	4.07	3.77	4 17

Time of planting and spacing on Mentha : In the spacing trials, the spacing of 40 cm x 40 cm recorded the maximum herbage yield per hectare (197.27 quintals/ha), essential oil content and essential oil yield (109.38 kg/ha). The same treatment also exhibited the highest leaf to stem ratio and dry matter accumulation (Table 123).

TABLE 123. Spacing trials on mentha

Treatments	Herbage yield (Quintals/ha)	Eesential oil content (%)	Essential oil yield	Leaf to stem ratio	Dry matter accumulation (g/m)
30 cm x 40 cm	142.15	0.48	63.87	1.10	315.80
40 cm x 40 cm	197 27	—	109.38	1.27	358 42
50 cm x 40 cm	112.72	0 56	62 05	0.94	126.24
60 cm x 40 cm	94.71	0.45	39.79	0.81	68.73
SE	14.39	0.12	6.43	0.077	29.433
CD	44 27	—	19.10	0.21	90.82

Planting during October - November showed the miximum establishment at the sixth month (46 and 58 per cent respectively). However, there was not much variation in the oil content.

Propagation studies on pepper and cinnamon : The study on the propagation studies of pepper through different types of cuttings, viz., cuttings from upper laterals, fruiting branches and single noded cuttings treated with IAA, IBA, NAA, Alar and 2-4,D revealed that cuttings from upper laterals recorded the highest rooting (84.3 per cent) when treated with IBA 5000 ppm and this was closely followed by single node cuttings treated with IBA 7500 ppm, (77.0 per cent) as compared to 31.3 and 10.0 per cent in the respective controls. Among the several growth regulators employed, IBA induced more number of roots and promoted root length in all the three types of cuttings.

In cinnamon between the two types of cuttings a higher percentage of rooting was recorded in hard wood cuttings than the semi - hard wood cuttings. The growth regulator treatments indicated that the rooting percentage showed a decrease with an increase in the concentration of IAA, 2-4,D and IBA. On the contrary, with the increase in concentration of NAA there was increase in the percentage of rooting. Specifically, the hard wood cuttings treated with IBA 2500 ppm recorded the highest percentage of rooting (45.0) and this was followed by cuttings treated with IAA 2500 ppm with 35.0 per cent of rooting. In the untreated control, the rooting was as low as 5.0 per cent. While considering the semi-hard wood cuttings the highest rooting percentage of 22.5 was observed with NAA 5000 ppm as compared to 2 5 per cent in the control.

Time of planting of cardamom (*Elettaria cardamom* **Maton) at Shevaroy Hills :** Monthwise planting trial with "Mysore" cardamom was taken up at Horticultural Research Station, Yercaud commencing from the month of June to November for three years in order to know the favourable month for planting at higher elevation from 1300-1500 metres above sea level. It was found that July planting gave the highest percentage of establishment of 87.92 per cent followed by August, September, October and November planting, giving 77 92, 75.42, 65.75 and 61.67 per cent of establishment respectively. In the case of June planting the percentage of establishment was only 19.95 per cent.

For better establishment there should be a minimum of 322.80 mm of rainfall and maximum and minimum temperature should not exceed 19.5 to 25 and 15.5 to 17.5°C respectively during the month under Yercaud condition.

Cashew : Rooting of shoot cuttings (soft wood cuttings) under intermittent mist conditions has been found feasible in cashew. A success of 36 per cent in rooting was recorded in the batch of cuttings set for rooting in June 1980. Further studies are underway to perfect the technique and to maximise the success. Another easy method of vegetative propagation devised for cashew was ground layering The method was found to record high success (90 per cent) in July operation.

Under plantation management practices, spraying cashew trees with a combination of 3 per cent urea + 0.05 per cent Endosulfan thrice recorded significantly higher yields than untreated trees, the mean increase being 1.405 kg/tree. Application of 2,4-D at 10 ppm also led to considerable increase in fruit set and consequent higher production. The treated trees registered a mean increase of 4.684 kg/tree over the check.

Soil Management

Turmeric : Application of 140 kg nitrogen, 50 kg P_2O_5 and 60 kg K_2O per hectare has recorded 22.9 tonnes of fresh rhizomes which is 56.2 per cent higher over the basal dose of 50 kg P_2O_5, 60 kg K_2O alone. An additional income of Rs. 2,904/-per hectare is expected by application of 140 kg of N/ha and an extra expenditure of Rs. 420/- only per hectare.

Foliar application of N on Geranium : Application of 30 kg Nitrogen/hectare i. e. 15 kg N as basal and 15 kg N as one per cent urea spray in two split doses at 45 days and 90 days after basal application recorded the highest number of branches (23.0), total plant spread (10693.74 sq. cm.) and herbage yield of 11480.02 kg/ha over unfertilized control (6796.68 kg/ha). The oil yield was 12.63 kg/ha for the same treatment as against control (4.76 kg/ha). This increase in herbage yield in the above treatment was 57.34 per cent over control).

Micronutrients on geranium : Among the treatments, Zn at 50 kg/ha has recorded the maximum yield of 7150 kg/ha/which is 62.4% more than the control. (Table 124)

TABLE : 124 Effect of Zn, B and Mo on geranium

Treatment	Mean yield kg/plot	Yield kg/ha	Oil content	Geraniol content (%)
Control	8.80	4400	0.075	57.63
Zn 12.5 kg/ha	9.20	4600	0.075	58.10
Zn 25 kg/ha	12.25	6620	0.080	57.15
Zn 50 kg/ha	14.30	7150	0.085	56.95
B 10 kg/ha	8.50	4250	0.075	58.00
B 20 kg/ha	10.50	5250	0.070	57.85
Mo 0.25 kg/ha	8.50	4250	0.080	58.00
Mo 0.50 kg/ha	9.50	4750	0.075	58.25

Effect of NPK on Mentha: Application of 60 kg N, 60 kg P_2O_5 and 10 kg K_2O per hectare recorded the highest maximum herbage yield of 104.29 quintal/ha as well as oil content (0.70 per cent) in the first cutting. The same treatment also exhibited the highest number of leaves of 369.7 and branches of 18.6.

Effect of NPK on Pyrethrum : For maximising the yield of dried flowers, application of 20 kg nitrogen in the form of urea, 120 kg of phosphorous in the form of super phosphate and 20 kg of potash in the form of muriate of potash is recommended.

Pest Management

Control of green peach aphid *Myzus persicae* **on chillies :** The aphid is effectively controlled by high volume spraying of methomyl (lannate) 90% WP at 0.1% and cent per cent mortality was obtained in a period of 72 hrs. The other best treatments for the control were methomidophos 400 ml/ac (0.05%), lannate 1 lit/ac (0.05%), monocrotophos 1 lit/ac (0.1%), metasystox 800 ml/ac, metasystox 400 ml + heptachlor 800 ml/ac. The sprayfluid per acre used was 400 litres(Tables 125 and 126).

TABLE 125. Effect of insecticides on *Mysuz persicae* Sulz on chillies at Vazhuthangulam, Thiruvannamalai Taluk (Mean of three replications)

Treatments	Percentage reduction in aphid population	
	One day after treatment	Three days after treatment
Methomyl (lannate) 90% WP 440 g/ac	97.62 (81.67)	100.00 (90.00)
Monocrotophos (Nuvacron) 40 EC ml+Nuvan 200 ml/ac	69.05 (56.48)	77.20 (61.95)
Monocrotophos (Nuvacron) 40 EC 1 lit/ac	61.64 (51.99)	88.73 (70.84)
Monocrotophos (Nuvacron) 40 EC 1 lit + Teepol 40 ml/ac	61.35 (51.58)	88.94 (70.67)
Fenitrothion (Labaycid) 40 ml/ac	51.23 (45.68)	55.30 (48.14)
Monocrotophos (Nuvacron) 500 ml + Dursban 400 ml/ac	37.32 (37.64)	73.25 (59.32)
Monocrotophos (Nuvacron) 500 ml + Sumithion 250 ml/ac	32.12 (34.22)	72.40 (58.85)
Vasambu 800 g/ac (Plant product)	1.40 (5.81)	17.58 (24.37)
Control	0.05 (1.28)	0.05 (1.28)
CD	6.24	6.51

(Figures in parantheses are transformed values)

TABLE : 128 Efficacy of different insecticides in controlling the cardamom stemborer *(Transformed data)*

Insecticidal treatments (0.1%)	Average percentage of stemborer incidence								
	After 1 stspray	After 2nd spray	After 3rd spray	After 4th spray	After 5th spray	After 6th spray	After 7th spray	After 8th spray	After 9 spray
Suphracide	7.7	8.0	15.9	16.8	19.2	13.2	16 5	17.2	20 2
Sumicidin	2.3	5.9	14.8	3.2	12.3	9.2	8.7	8.5	10 0
Bendiocarb	3.8	2.8	11.0	6.7	15.3	7 8	9 2	12.3	9 9
Tamaron	5 3	6.8	15.1	9.8	23.8	16.9	16.2	17.5	15.6
Phendal	4.4	7.7	14.2	11.7	29.2	23.6	22.6	17.3	23.2
Tafethion	5.2	4.1	13.7	14.5	26.4	16.4	18.6	20.3	25.8
Diazinon	3 8	5 3	16.8	16.7	24 0	20.2	22.2	16.3	22.2
Heptochlor	4.9	4.8	13.8	12.8	29.4	18.7	20.9	17.1	21.1
Sumithion	2.2	2.1	14.1	18.5	21.3	22.7	29.8	18 9	20.9
Vamidothion	4.2	5.9	18.7	25 9	32.9	15.9	20.5	20.8	27.0
Furadan	8.8	5.1	16.3	9.9	23.4	16.8	21.4	14.8	18.8
Acephate	5.6	5.6	10.5	7.4	15.6	6.6	15.7	9.4	14.7
Offanol	4.2	5.7	16.8	12.8	26.4	22.8	24.1	16.4	19 0
Untreated	3.7	2.5	14.8	8.2	23.4	13.6	11.9	17.2	26.2
F Test	NS	NS	NS	NS	NS	NS	NS	NS	Significant
CD at 5%	—	—	—	—	—	—	—	—	7.53

Control of Betelvine scale (*Lepidosaphos corhutus*) : The scale insects can be controlled by spraying chlorphyriphos causing 75.5% and 81.4% mortality during 5th and 11th day after spraying. The pesticides residue at the time of harvest was below the tolerance level.

Disease Management

Control of wilt and mosaic in Chillies : *Fusarum oxysoporum*, the wilt inciting pathogen was detected in chilli seeds. The fungus infection reduced seed germination, growth rate and fruit yield. Seed-borne infection induced wilting in the transplanted crop and fruit rot was commonly observed. Bavistin or Vitavax C seed treatment eradicated the pathogen from seed and induced good growth of the plants and higher yield (Table 129).

TABLE 129. Efficacy of seed treatment on plant growth and yield of chillies

Treatment	Height of the plants in cm.	No. of fruits/plant
Thiram	40	26
Baytan	47	27
Bavistin	45	47
Benlate T	33	37
Vitavax C	49	53
Control	28	10
C. D.	6	10

For checking the spread of chilli mosaic disease, insecticidal trials were conducted to control the aphid vector. The disease incidence 90 days after planting is given in Table 130.

TABLE: 130. Percentage of incidence of chilli mosaic (Transformed value)

Treatments	Disease incidence	Yield (kg/plot)
Dimethoate 0.05%	2.72	15.8
Methyl demeton 0.025%	3.91	18.4
Endosulfan 0.07%	3.54	14.8
Monocrotophos 0.05%	3.62	17.4
Emulsifiable oil 0.5%	4.22	15.1
Fenthion 0.05%	3.70	18.8
Phorate G 1.5 kg a. i./ha	3.44	18.0
Carbofuran G 1.5 kg a. i./ha	2.56	20.4
Aldicarb G. 1.5 kg a. i./ha	3.73	17.5
Control	4.57	15.8
C. D. (p=0.05)	0.372	2.33

The results revealed that spraying Dimethoate 0.05% or Monocrotophos 0.05% six times at fortnightly intervals from 21 days after planting or spot application of Carbofuran or Phorate granules at 1.5 kg a. i./ha twice (15 and 60 days after planting) were effective in reducing the disease incidence significantly.

Disease Management in Cardamom : During the year 1980, a fungicidal trial against capsule rot was laid out at Gandhipara Estate. The following thirteen treatments (1) Control, (2) Perecloud dust 4% (12 kg/ac) (3) Bordeaux mixture 1% (4) Emulsicop (0.3%), (5) Morut spray (0.5%),

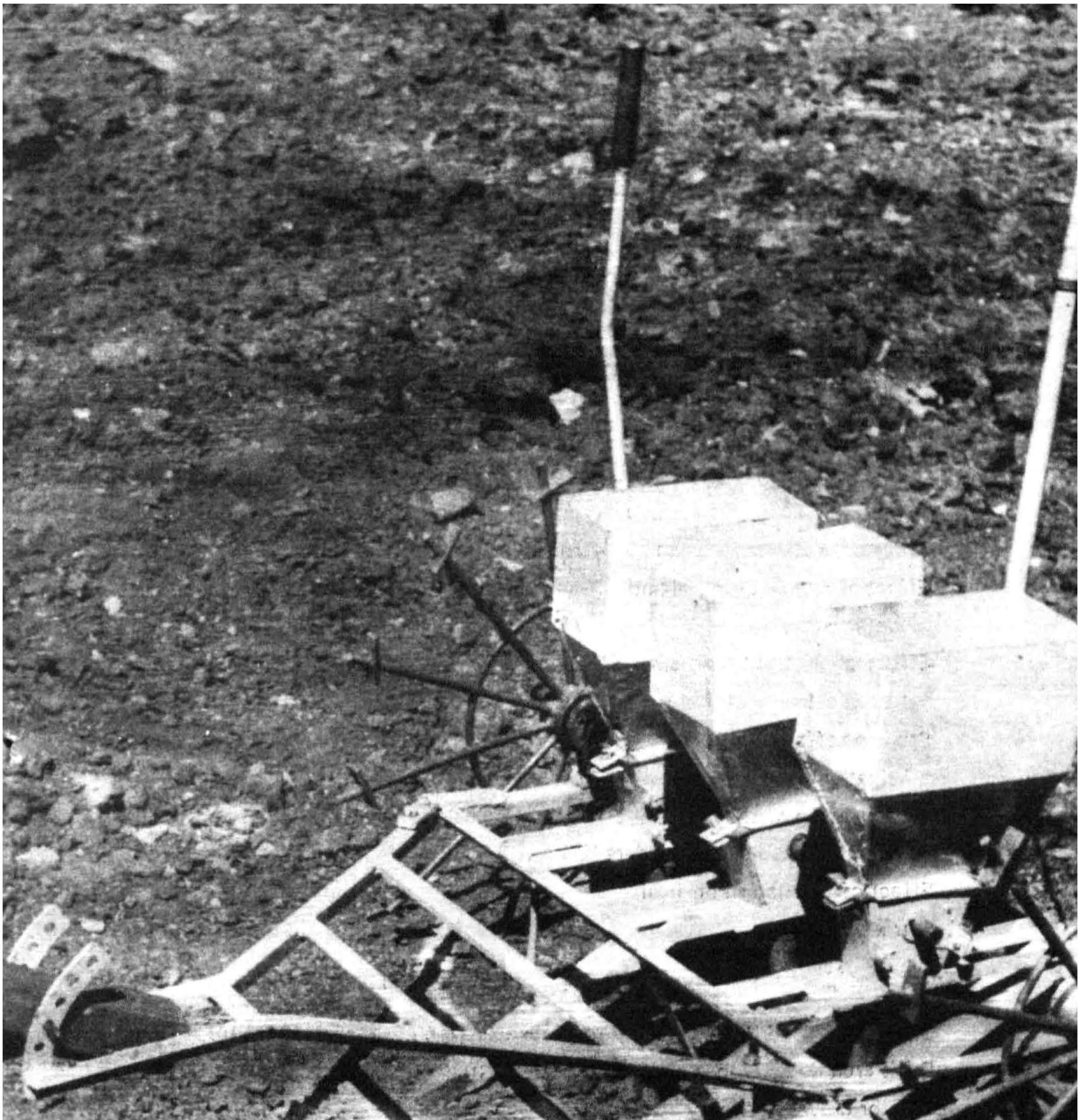
(6) Bay 5072 spray (0.5%), (7) Bay 5072 dust (4 kg/ac) (8) Bay 5072 dust (8 kg/ac) (9) Morut dust (4 kg/ac) (10) Morut dust (8 kg/ac), (11) Perecloud 6% dust (12 kg/ac) (12) Perecloud 12% dust (8 kg/ac) and (13) Thiride 5% dust (20 kg/ac) were replicated thrice and the first round of treatments were given during June, 80 before the commencement of South West monsoon. Subsequently two treatments were given at monthly intervals. Observations on incidence of capsule rot was recorded before the second round of treatments and the final count was taken a month after last treatment (IIIrd round). The three counts were pooled and the data were analysed statistically. The percentage incidence were transformed into angles. The mean of the counts are presented in the Table 131.

TABLE 131. Mean incidence of capsule rot

Treatments	Mean incidence of capsule rot (transformed value)
Control	27.10
Perecloud dust 4% (10 kg/ac)	19.23
Boredeaux mixture 1%	15.11
Emulsicop (0.3%)	23.81
Morut spray (0.5%)	21.75
Bay 5072 (0.5%)	23.81
Bay 5072 dust (4 kg/ac)	8.32
Bay 5072 dust (8 kg/ac)	11.71
Morut dust (4 kg/ac)	13.77
Morut dust (8 kg/ac)	23.02
Perecloud 6% dust (12 kg/ac)	12.46
Perecloud 12% dust (8 kg/ac)	10.78
Thiride 5% dust (20 kg/ac)	15.05

The results revealed that application of Bay 5072 as dust at the rate of 4 kg per acre will be effective in minimising the capsule rot, when compared to the other treatments.

❋ ❋ ❋


PLANTER (3 TYNED)
AGRICULTURAL ENGINEERING

CONTENTS

Soil and Water Conservation 171

Determination of consumptive use of water in sorghum 171

Effect of mulching on soil and water conservation 171

Effect of different strip emitters in saline water irrigation 172

Study on effective rainfall for irrigated cotton 173

Water saving methods in irrigating vegetables and fodders 173

Effect of vegetation on infiltration rate 174

Farm Machinery 174

The TNAU Hand Pump 174

Brick arch dome biogas plant 175

Tractor drawn bed former 175

Multi-purpose tool bar 176

Biogas Technology 176

Solar energy

Solar drier 176

Solar cooker 177

Cabinet drier for cash crops 177

Electricity from cowdung 178

Agricultural Processing 178

Dehusker for Arecanut 178

Poultry feed pelletizer 179

Effect of moisture on bulk density and angle of repose 179

Agricultural Structures 179

Design of an outlet structure 179

Standardization of threshing floor 179

Soil and Water Conservation

Determination of consumptive use of water in sorghum crop : Two varieties of sorghum viz., Co 24 and Co 22 were taken up for the study and the calibrated Neutron probe was used for measurements. Water input through precipitation and irrigation were both noted. Irrigation water was applied on observing the soil and crop conditions. Water lost in deep percolation was estimated from the soil moisture status with reference to the effective rootzone depth 60 cms. It was found from the moisture readings that both the varieties consume 36 cm of water to meet their evapotranspiration requirements. For Co 24 variety the deep percolation was estimated as 12.70 cm and for Co 22 it was 10.9 cm for the entire crop period. Water lost in runoff was practically nil. Irrigation water given to both the crops was 40 cm excluding rainfall. The water application efficiency in the case of Co 24 was 67% and that for Co 22 was 73%. The available moisture for the clay loam soil was found to be 11.5 cm in the root zone. (Table 132). Irrigation schedules were worked out for both the varieties based on the consumptive use, for 50% moisture depletion. It is reckoned from the data that Co 24 needs irrigation once in 20 days and Co 22 needs once in 16 days after the life irrigation. Linear relationships established between duration and cumulative consumptive use were :

$y = 0.26\,x + 0.80$ for Co 24

$y = 0.33\,x - 0.02$ for Co 22

where,
y = Cumulative consumptive use in cm
x = duration in days

TABLE 132. Consumptive use of water in sorghum crop

Variety/ duration	Precipitation cm	Irrigation cm	Consumtive use cm	Deep percolation cm	Pan evaporation cm	Crop factor	Water use efficiency
Co 24 (134 days)	8.66	40.08	25.68	12.70	0.36	0.42	67
Co 22 (110 days)	6.17	40.24	35.92	10.92	0.43	0.51	73

Effect of mulching on soil and water conservation : The experiments were conducted on sunflower in the clay loam soil adjacent to the College of Agricultural Engineering. The mulching materials tried were (i) cumbu straw (ii) sugarcane trash (iii) sorghum straw and

(iv) polyethylene (white)sheet. The moisture status was observed at different intervels of time throughout the crop period. The sugarcane trash provided the highest degree of moisture conservation in the sub soil. (Table 133) and gave the highest yield of 1020 kg/ha of Sunflower. The yield obtained in other treatments were 780 kg/ha in control, 900 kg/ha in cumbu straw, 895 kg/ha in sorghum straw and 950 kg/ha in polyethylene (white) sheet.

TABLE 133. Moisture storage (in percentage) over the root zone depth of 60 cm

Treatments (days after sowing)	Control	Cumbu straw	Sugarcane trash	Sorghum straw	Polyethylene (white) sheet
24	16.05	17.06	17.68	16.79	17.34
27	14.90	16.37	17.30	16.16	16.58
31	15.27	16.64	17.54	16.52	16.99
34	16.95	18.18	18.55	18.11	18.39
41	21.15	21.94	22.67	21.73	22.25
46	19.94	20.52	21.80	20.13	21.22
52	17.91	19.13	19.80	18.87	19.61
62	19.06	20.26	22.05	20.15	21.00
66	17.52	18.57	20.24	18.16	19.85
69	16.40	17.53	19.14	17.30	18.94
73	15.83	16.99	18.06	16.69	17.68
76	17.03	17.86	18.76	17.54	18.26
80	16.56	17.54	18.28	17.29	18.03
83	16.19	17.13	17.74	16.93	17.50
87	15.61	16.53	17.17	16.44	16.88
92	15.23	16.13	16.82	15.96	16.34

Effect of different strip emitters in saline water irrigation : Different emitting types such as hole and sockets, nozzles and microtubes have been coming to the market and have been used in drip irrigation practices. However different emitters differ in the size of opening. A doubt may naturally arise whether the openings could be clogged down when used for saline water. Also the area of wetting and hence the extent and intensity of salt deposition vary from one type to another.

In the present study, irrigation water was delivered through the emitters namely (i) microtube (ii) nozzles and (iii) hole and socket to bhendi crop. The salt deposition was found out by measuring EC at 15, 30 and 45 cm depths for the whole of the area around the plant. The average salt content over the depth of 15 cm is given in (Table 134).

TABLE 134. Salt concentration in micromhos/cm for different emitters at 15 cm depth

	Microtube	Nozzle	Hole/socket	Remarks
After 30th day	1156	1068	1083	Total rainfall during
After 60th day	1159	1278	1426	the crop period is
After 90th day	1354	1286	8286	161.9mm in 20
				rainy days

Concentration of salt in nozzle system was less around the plant owing to the moisture spread in the longer area and to a deeper horizon. Since the water trickles at a feebler rate in the case of hole and socket system, the moisture spread was localized and hence salt deposition was higher. The delivery of irrigation water through microtube resulted in salt clogging problems and found not suitable for saline water situations from the operation point of view. The study revealed that the nozzle system is desirable for the saline water irrigation through drip system.

Study on effective rainfall for irrigated cotton under Coimbatore condition : Effective rainfall for irrigated cotton MCU 5 in the clay loam soil of Coimbatore was measured and determined by soil moisture measurement method and deep percolation measurement method in which the former was better than the later. The measured effective rainfall and water requirement of crop are 326 and 782 mm respectively. A rational approach was developed to estimate the effective rainfall for the crop period from the intitial soil moisture status, daily rainfall and the amount of irrigation water applied. This approach includes the development of the empirical equations to predict the soil moisture status for the crop period. Applying this procedure, the time of irrigation in the schedule of irrigation was predicted for the crop period. The predicted effective rainfall and time of irrigation were in aggrement with the measured effective rainfall and actual date of irrigation.

Water saving methods in irrigating vegetables and fodder crops : Sprinkler system was installed in NP 21 fodder grass field. The system was operated daily for 30 minutes. The plot received about 0.46 cm of water daily. The control plot has raceived 17.49 cm and trial plot under sprinkler irrigation received 13.30 cm as on 24-3-80 Bhendi under drip irrigation received 15.06 cm. However crop growth was not good due to aphid and stem borer attack. So the bhendi crop failed. the next bhendi crop was raised on 9-5-80 in drip experimental plot. A control plot with conventional furrows was established nearby. The drip plot received 37.30 cm of water including rainfall, while the control received 56.4 cm

The implement is able to make alternate furrows and beds in a well ploughed prepared land. The top width of beds and furrows are 30 and 45 cms respectively. The depth of furrow is 15 cm. The centre to centre distance of furrows or beds is 75 cm. The furrows and beds are useful for sorghum, maize, sunflower, cotton, groundnut, etc. The area of coverage is 2.5 to 3.0 ha per day of 8 hours and cost of operation is Rs. 100/- per ha. (Plate 43).

Multi-purpose tool bar : A tool bar in which various implements like melur ploughs, harrows, ridger, bund former, etc. can be attached, was developed to reduce the initial investment on cost of farming.

Two units, one with 'L' angle as frame material and the other with G. I. pipe as frame material were designed and fabricated. The field capacity of these two units when used for melur ploughs was found to be 0.1425 ha/hr whereas the field capacity of a conventional country plough, was 0.05 ha/hr. The cost of G. I. pipe unit is Rs. 285/- whereas the cost of the unit with 'L' angle is Rs. 235/-. The weight of the unit with G. I. pipe and with 'L' angle are 63 kgs and 42 kgs respectively.

The units were tried in the Millet Breeding Station and wetlands in Coimbatore campus and the results were encouraging.

Biogas Technology : The effect of incorporation of chopped materials ($\frac{1}{2}$" - 1" bits) of (i) parthenium, (ii) saranai and (iii) banana peduncle along with cowdung and old slurry in the proportion of 1 : 4 : 1 (v/v)respectively, was studied in relation to gas generation over a period of 12 weeks. The parthenium incorporated treatment gave a maximum gas generation of 1442 cc/day followed by saranai of 1294 cc/day. The control having cowdung + old slurry alone, however, recorded only 711 cc/day.

Solar energy : The infra-red and far infra-red rays of electro-magnetic spectrum of the solar energy find their application in heating. The exploitation of ultra-violet rays and rays of visible range needs further intensification. The particulars regarding the models of solar drier, solar cooker and cabinet drier evolved are furnished.

Solar drier :

(a)	Size of the flat plate collector	... $8 m^2$
(b)	Air space between glass and absorber plate	... 4 cm
(c)	Back insulating media	... 5 cm thick saw dust
(d)	Additional features	... Iron filings in air duct.

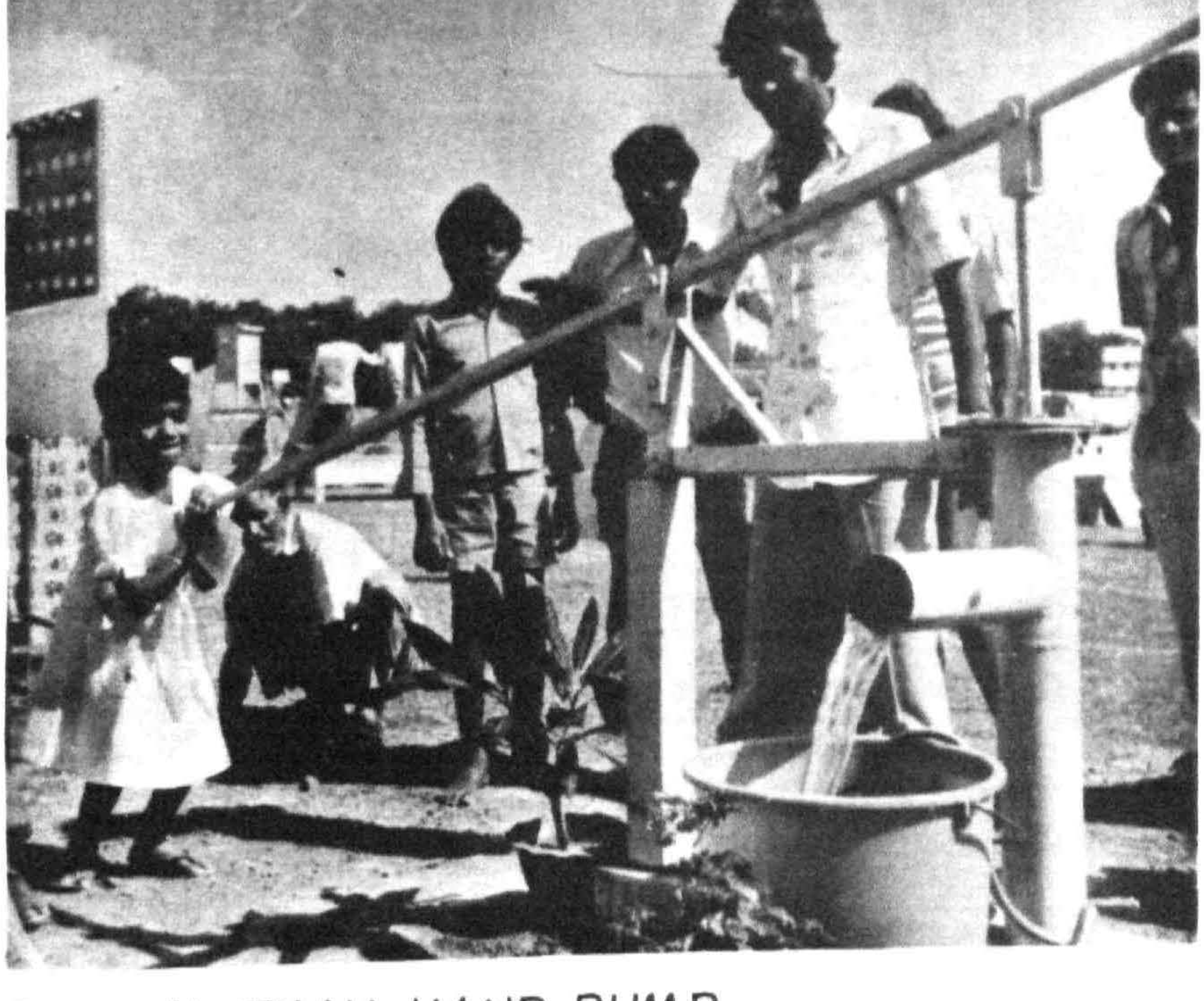


Plate 41. TNAU HAND PUMP

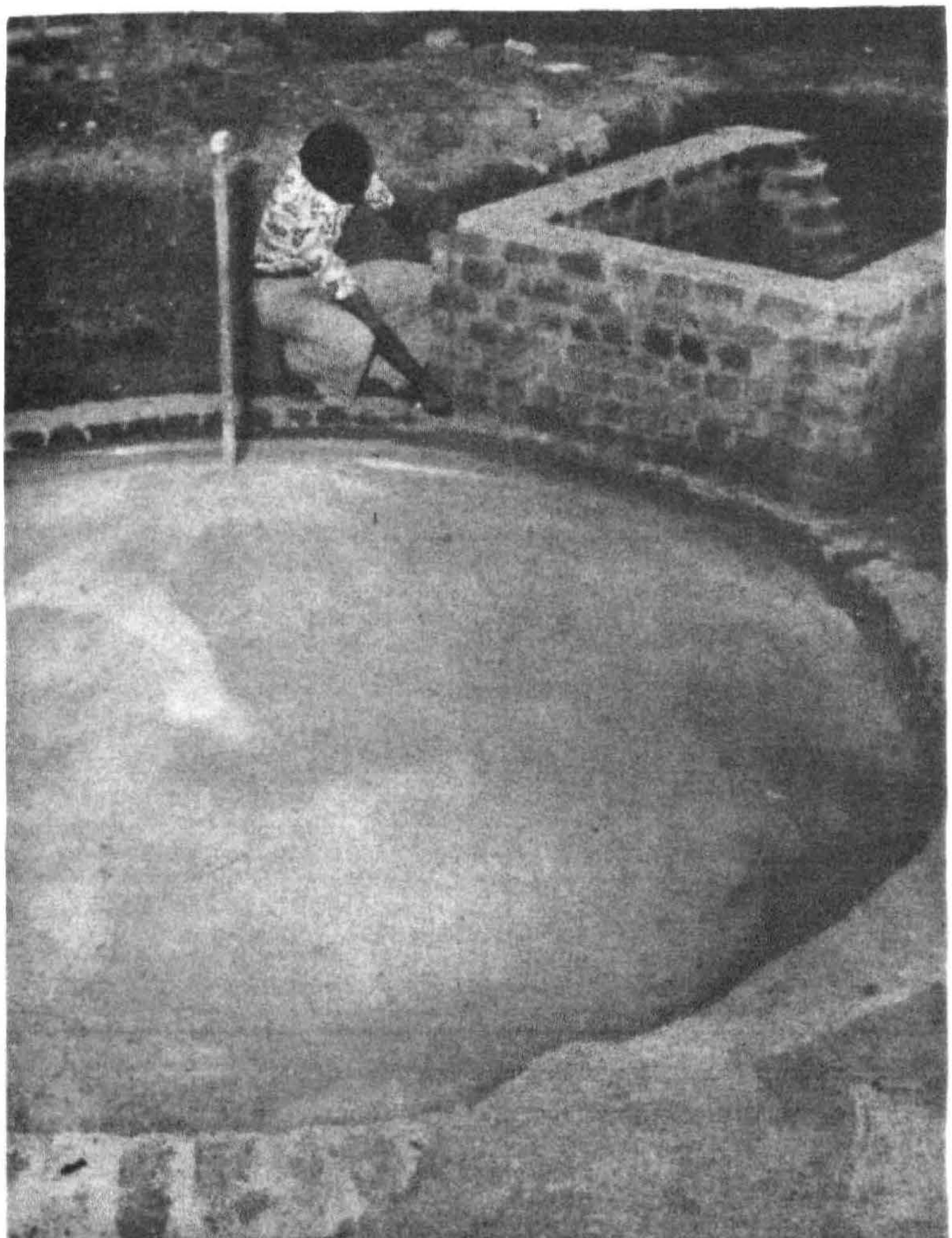


Plate 42 BIOGAS PLAN

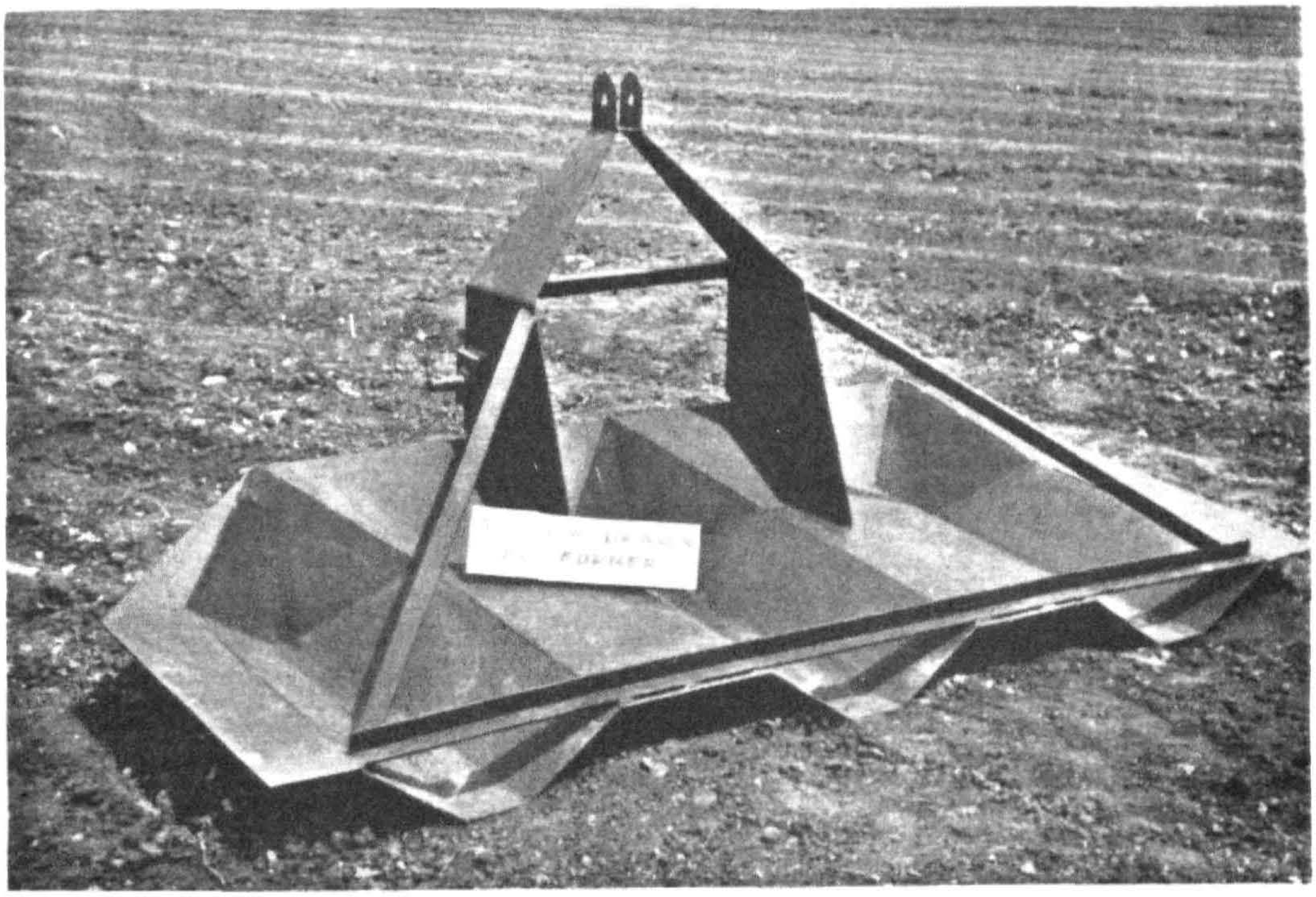


Plate 43. TRACTOR DRAWN BED FORMER

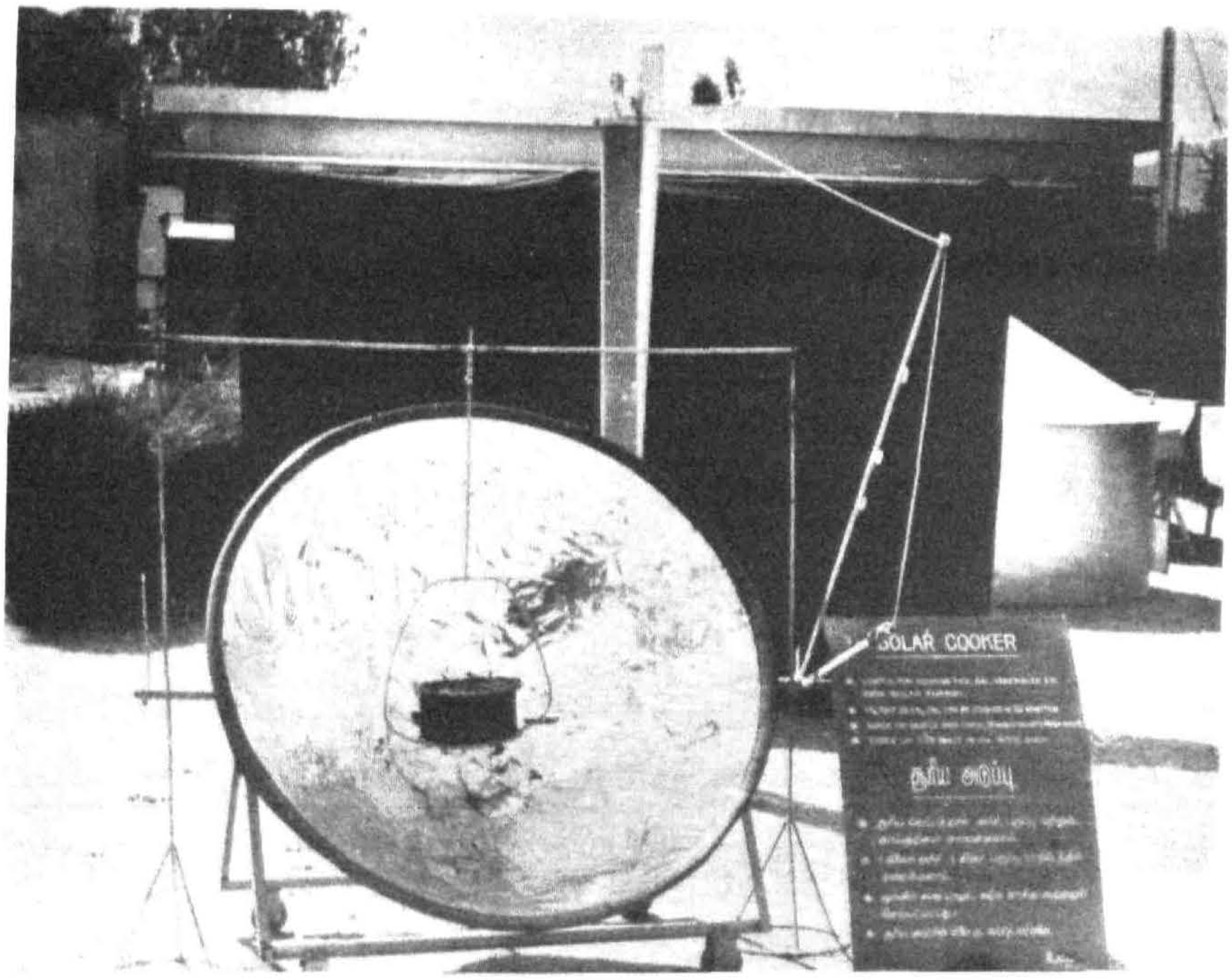


Plate 44 SOLAR COOKER

TABLE 138. Efficiency of solar drier

Crop	Solar energy	Moisture content Initial %	Final %	Drying time Conventional Hrs	Solar drier Hrs
Sorghum	51 5 ± 3.5 mw / cm^2	24	15	18	9
Bajra	50.0 ± 3.0 mw / cm^2	20	12	19	9
Paddy	56.0 ± 4.0 mw / cm^2	22	12	20	8

Solar cooker: (Plate 44).

(a) Reflecting media of paraboloidal concentrating cooker.
(i) Glass mirror and (ii) Anodised polyster film (400 g) in silver shade.

(b) Focal distance above the apex : 20 cm

(c) Boiling or cooking time needed when solar energy is 50 mw/cm^2.

Item	Quantity	Minutes
Water	3 lit.	30
Raw rice	1 kg	40
Boiled rice	½ kg	45
Pulses (Dhal)	¼ kg	45
Vegetables (brinjal lablab, bhendi)	¼ kg	40
Greens	¼ kg	35
Eggs	4 Nos.	15
Meat	¼ kg	75
Frying bajji	...	20

Cabinet drier for cash crops: (Plate 45).

(a) Number of absorber glass plates : 2
(b) Air circulation through Chimney : Natural convection
(c) Test results : At 32°C ambient temperature and 50 + 5% R. H.
  (i) Solar intensity : 30 ± 2 mw / cm^2
  (ii) Cabinet inside temperature : 71.5 ± 3.5 deg C

TABLE 139. Efficiency of cabinet drier

Crop	Moisture contents		Drying time	
	Initial	Final	Conventional	Cabinet Drier
	per cent		Hrs	Hrs
Chillies	65.0	14.0	30	6
Coconut (copra)	40 0	1.0	16	9
Tapioca (cassava)	57 0	2.0	12	8

Electricity from cowdung : A new innovation has been made in obtaining 'Electricity' directly from cowdung. This 'Gobar cell' consists of carbon as 'positive' electrode and 'zinc' container as negative electrode. The electrolyte is cowdung slurry.

The 'Gobar cell' is similar to ordinary battery which is in wide use for quite some time. A battery converts chemical energy directly into electric energy. It consists of two electrodes of dissimilar materials isolated from each other electronically, in a common ionically conductive electrolyte.

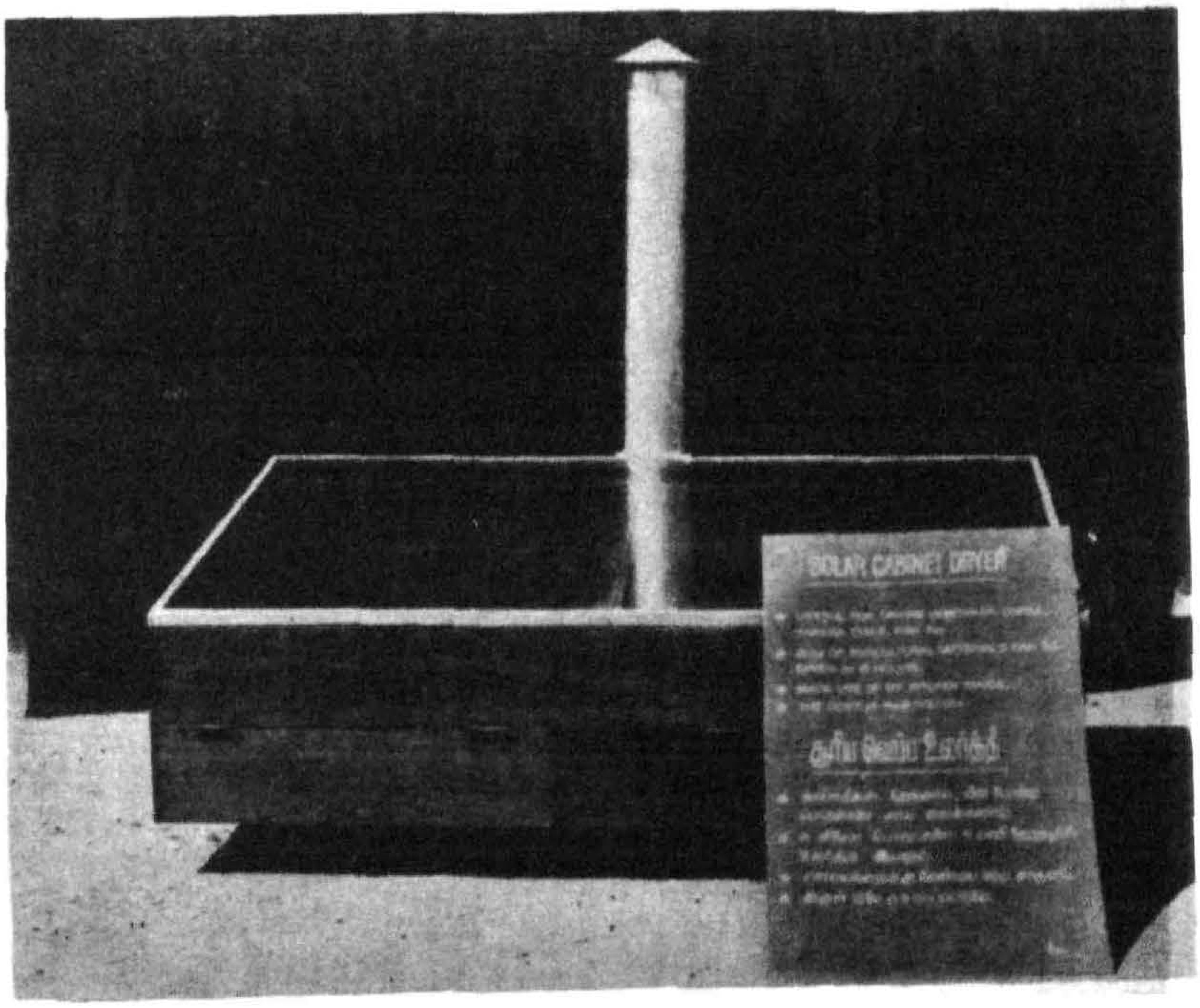
In this Gobar cell, the size of the zinc container, which is used as a 'negative electrode', is 20 cm x 20 cm x 20 cm and this is filled with 'cowdung' slurry approximately to three fourth the height of the container. The volume of cowdung slurry used per cell is 6000 cm^3. Here the negative electrode (zinc) is oxidised (increased in valency) during discharge giving up electrons to the external circuit. The positive electrode is used as oxygen donor and it receives electrons from the external circuit. Charge transfer from one electrode to the other within the cell is via the cowdung electrolyte.

Each cell is capable of developing 1.25 volts at 250 - 400 mA of current. when four such cells are connected in series the system can develop 5V at 250-400 mA of current. Now this electrical power can operate a transistor directly and this has been successfully tested at Tamil Nadu Agrl. University, Coimbatore.

AGRICULTURAL PROCESSING

Dehusker for Arecanut : A dehusking machine for arecanut has been developed. The out-turn of this machine is 15 kg of dried fruits/hour and the cost of dehusking is Rs. 7 / q of fruits. The dehusking efficiency is 95% and the breakage is noted to be 4.5%. When compared to the conventional method, the savings works to Rs. 9.90 per quintal of fruits. The percentage saving in time and cost is 81.20% and 58.40% respectively. (Plate 46).

Plate 45. SOLAR CABINET DRIER



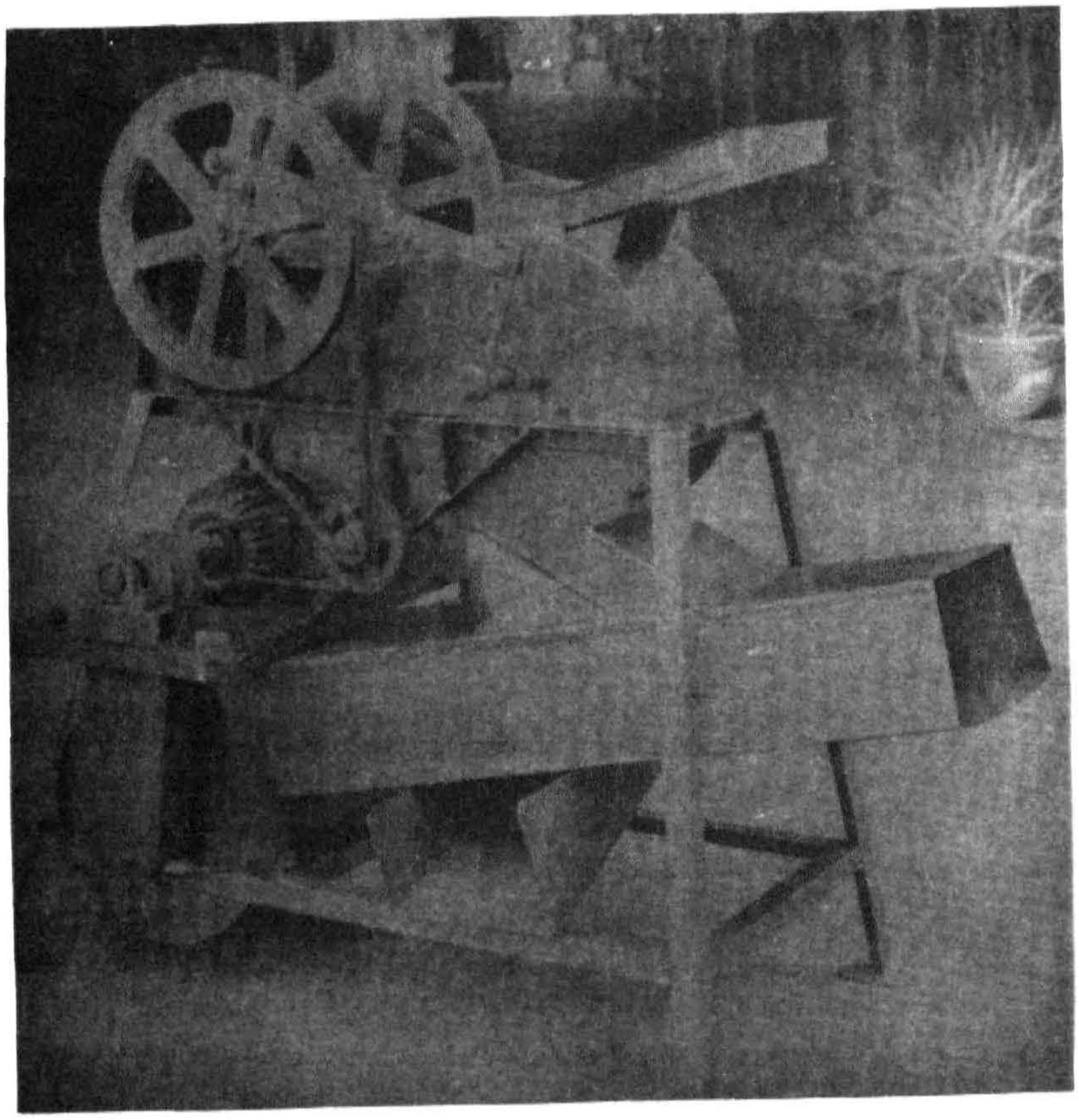


Plate 46. DEHUSKER FOR ARECANUT

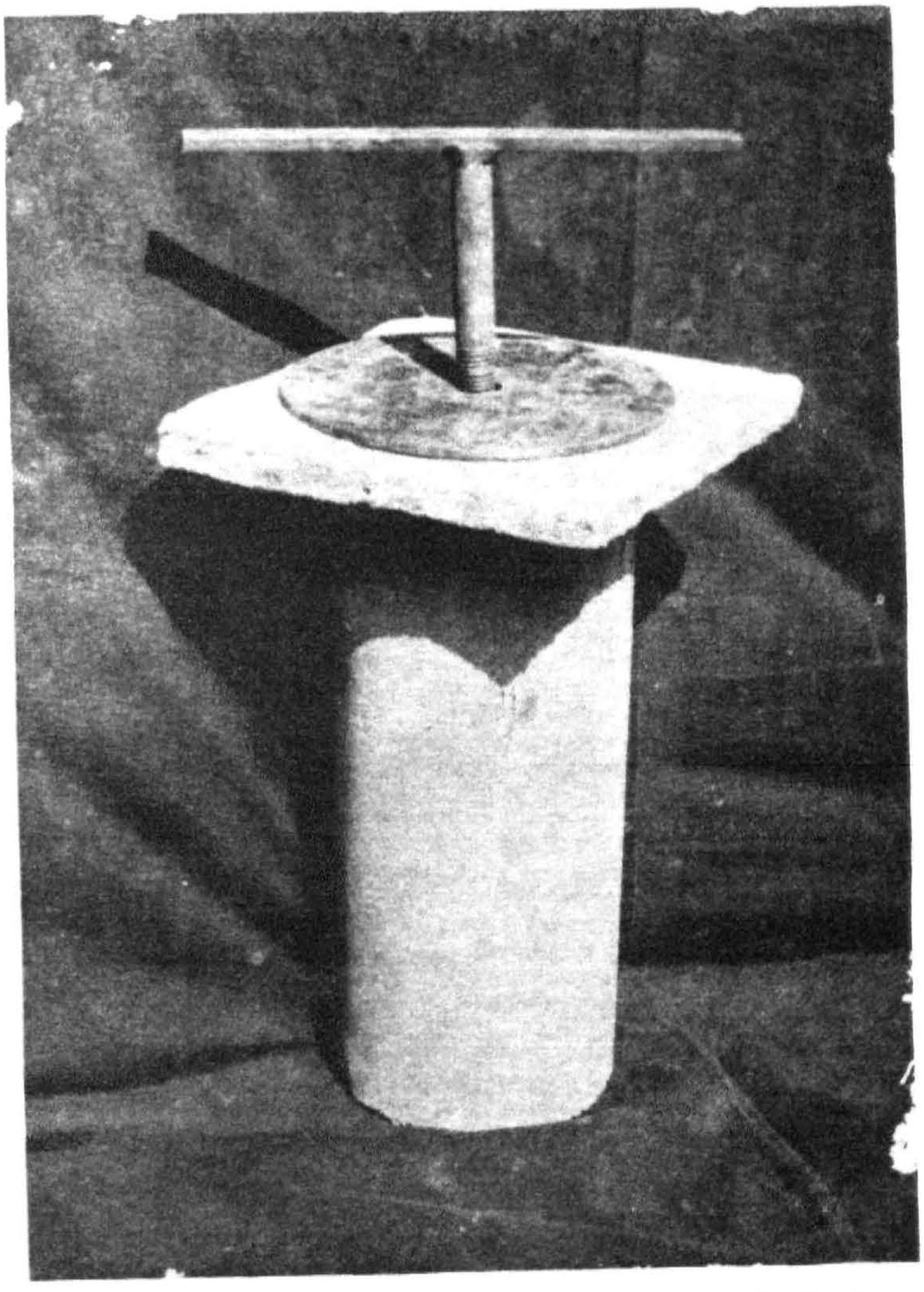


Plate 47. OUTLET STRUCTURE

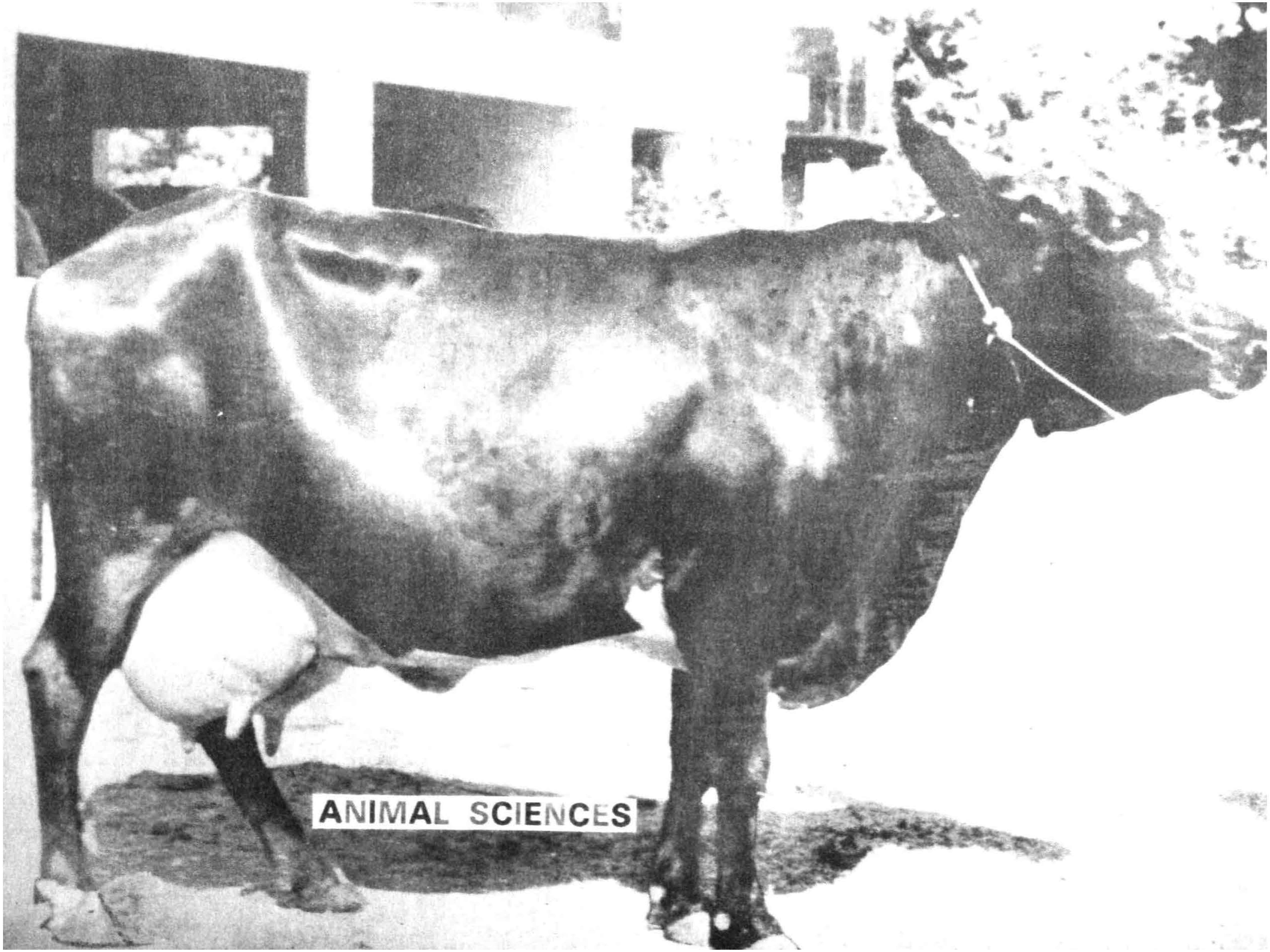
Poultry feed pelletizer: A poultry feed pelletizer has been developed which can produce about 25 kg of poultry feed pellets/hour. Pellets of about 5 x 12 mm size are produced by this machine. The cost of the unit is about Rs. 2750/- and the cost of operation is 25 paise per hour.

Effect of moisture content on bulk density and angle of repose & cereals : From the studies conducted on the angle of repose and bulk density of cereal crop (paddy, ragi, cumbu, cholam, maize and samai) *it has been found that the angle of repose increases with increase* in moisture content and it is reverse in the case of bulk density.

AGRICULTURAL STRUCTURES

Design of an outlet structure : An outlet structure called the riser valve for low pressure pipe line Irrigation system developed was field tested and found to work efficiently. The maximum pressure of its working is 0.8 kg/cm^2 which is the range of low pressure pipe line. The cost of one valve works out to Rs. 26. (Plate 47).

Standardisation of Threshing floor : Based on random survey, sizes of Threshing floor and drying floor for normal holdings of 5 ha, 10 ha, 15 ha and 20 ha were finalised. The designs of these structures in respect of construction in black cotton soil and red soil using locally available materials were prepared. The quantity of materials and labour required for construction were also computed.


ANIMAL SCIENCES

CONTENTS

Cattle 182

Induction of lactation in non-pregnant sterile non-lactating animals 182

Ultrasonic massage of mastitis affected udders 182

Sheep 183

"Sandy" - A newly evolved breed 183

Unconventional sources of sheep feed - Avicennia meal as feed for sheep 186

Sargaasum meal (seaweed) as a feed for sheep 186

Effect of stall feeding on the performance of growing lambs 187

Poultry 187

Studies on position of hatching eggs during storage in broiler breed 187

Effect of certain feed additives on hatchability in broiler birds 187

Relationship between shape and size of eggs with hatchability 187

Tarmarind seed - an unconventional source of poultry *feed* 187

Rice polish as replacer of maize *in* starter mash 188

Cheap poultry feed 188

Mineral mixture in the growth of broiler chicks 188

Influence of Liv '52 on the growth rate of broiler chicks 188

Control of ectoparasites of poultry 188

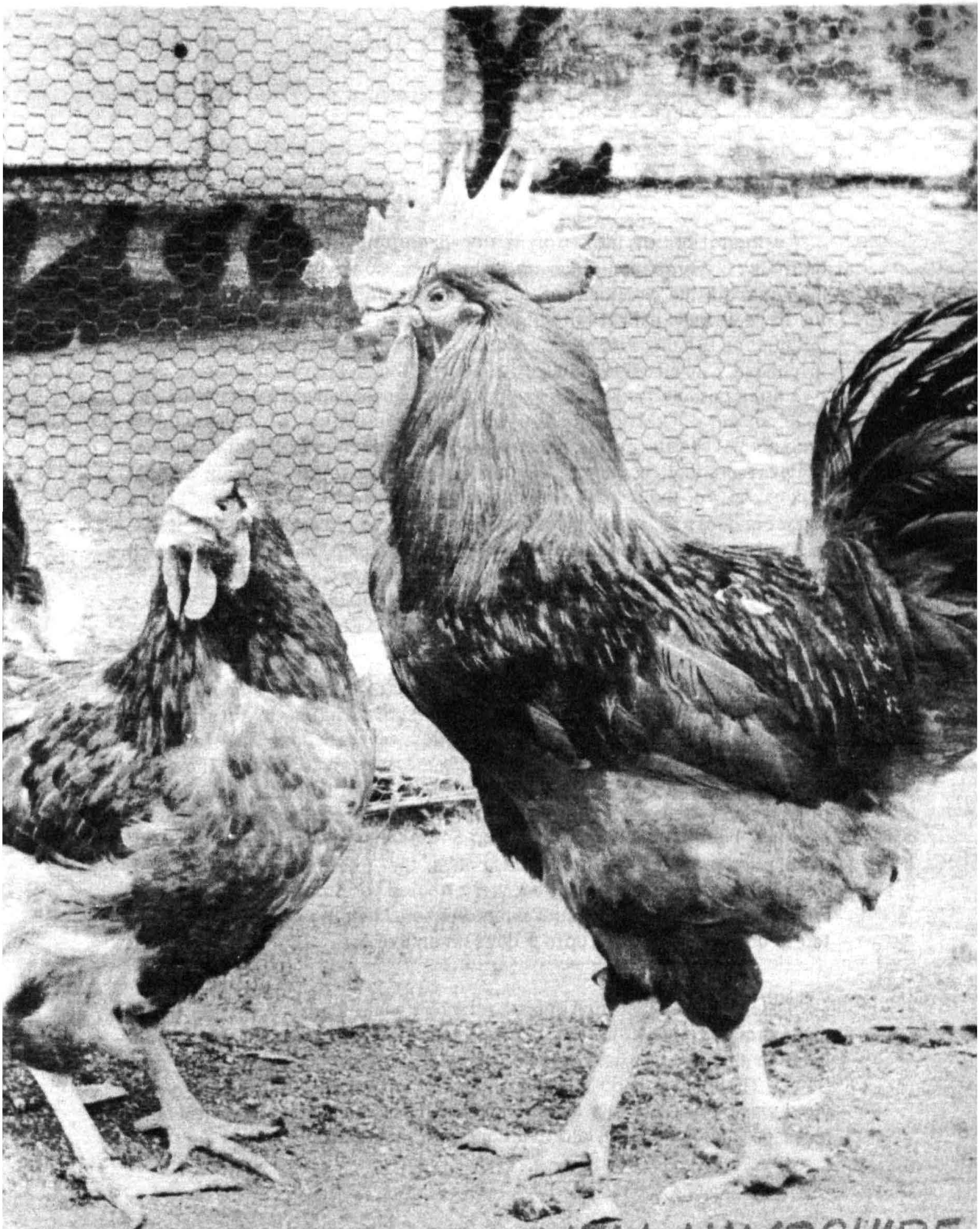
Quality of eggs stored at room temperature 189

Studies on the preservation of shell eggs 189

Studies on the quality of market eggs 189

Swine 190

Dogs 190


NEW HAMPSHIRE

ANIMAL SCIENCES

CATTLE

Induction of lactation in non-pregnant sterile non-lactating animals : Three non-pregnant and sterile cows were treated with hormones for the development of udder and initation of lactation. All the three animals exhibited the development of udder and lactation was initiated on 9th day after first injection. Out of the three, two animals responded with sizeable amount of milk and the milk production went upto two litres per day for single milking. The animals came to heat with the development of Graffin follicle, ovulation and formation of corpus lutem with normal oestrus cycles. It appeared that induction of lactation did not hamper reproductive cycle. The milk samples did not differ from normal milk except for the lactose and chloride content which were more in the former and less in the latter respectively. This study explored the possibility of exploiting the production potential of high yielding cows which become sterile or unable to have normal reproduction.

Ultrasonic massage of mastitis affected udders : Infection of udder due to microbial infection is common in cattle and is generally treated with antibiotics supported corticosteroids. This treatment caused glandular dysfunction and fibrosis which in turn resulted in loss of milk production. To overcome the dyfunction of the udder and facilitate improvement in the milk yield, ultrasonic massage was tried The study was conducted in white cattle affected with mastitis under each of the three groups, viz. early (1-3 months), middle (3-6 months) and late (6-10 months) lactation periods, with antibiotic therapy as control. Milk yield, prior to the attack and 15 days after the treatment were recorded. The clinical cases numbering 134, were treated for 5 days with antibiotics. From the third day, when acute symptoms subsided, the udder was subjected to ultrasonic massage upto 5 days on an average.

In the early lactation animals, the milk yield was 91% in the treatment group whereas in the control, the yield was 65%; in the middle lacation animals, the yield was 83% whereas in the control the yield was 51%. The yield was 55% in the treated group whereas in the control the yield was 52% in the late lactation cows. It was concluded that ultrasonic massage improved milk yield to an appreciable extent.

SHEEP

"SANDY"-A newly evolved breed : "Sandy" a fine wool breed of sheep adapted to the agroclimatic conditions of the Nilagiri hills was evolved at Sheep Breeding Research Station, Sandynallah. This breed was evolved as a result of crossing of Soviet Merino and Rambouillet (exotic breeds) with Nilagiri (indigenous breed) sheep. These two exotic breeds were crossed to improve the wool yield and quality and body weight of Nilagiri sheep. Merino sheep were imported from the U.S.S.R. for this purpose. Breed crosses having various levels of Soviet Merino and Rambouillet inheritance were created. On the basis of analysis of economic traits it was concluded that breed crosses having 5/8th Merino and 3/8th Nilagiri inheritance possess the desired characteristics. By interbreeding this group, the new fine wool breed was evolved. 'Sandy' sheep are capable of producing 2.70 kg of greasy fleece per annum with a fibre diameter of 21 microns. Moreover, the staple length of the wool is suited for making the fabric by 'worsted process'. The ewes of this breed attain a body weight of 33 kg at two years of age which is a desirable characteristic. By rearing this new breed of sheep, the farmers can increase their income atleast by two-folds. (Plate 48).

Estimation of repeatability co-efficient for wool quantity and wool quality in Grozney Merino sheep :

(i) **Wool Quantity** : Greasy Eleece yields of Grozney Merinos, born during February-April 1973 lambing season and from 1974 to 1979 were collected and their age-war mean and standard error are presented in Table 140.

TABLE 140. Greasy Fleece yields of Grozney Merinos

Age group/ order of clip	Greasy Fleece yield in kgs Mean ± S. E.
I	2.310 ± 0.77 (36)
II	4.179 ± 0.133 (34)
III	4.404 ± 0.211 (20)
IV	3.622 ± 0.178 (12)
V	4.260 ± 0.137 (18)
VI	3.700 ± 0.319 (4)

Note : Figures within parantheses indicate the number of animals involved

Statistical analysis revealed that there existed significant difference in mean greasy fleece yield between different age groups. Maximum wool yield of 4.404 kg was recorded on third year. Repeatability co-efficient for greasy fleece yield in Grozney Merino worked to 0.404.

(ii.) **Wool quality - Fibre diameter and staple length :** Fibre diameter and its staple length of Grozney Merino (born during February-April 1973 lambing season) from 1974 to 1979 clips were collected and analysed age group wise and presented in Table 141.

TABLE 141. Fibre diameter and staple length of wool

Age groups	Fibre diameter (in microns)	(Staple length (in cm)
order of clips	Mean ± Standard error	Mean ± Standard error
I	18.835 ± 0.322 (36)	8.028 ± 0.178 (29)
II	17.840 ± 0.397 (30)	7.732 ± 0.216 (28)
III	18.794 ± 0.142 (20)	7.855 ± 0.219 (20)
IV	18.855 ± 0.351 (11)	7.614 ± 0.235 (8)
V	18.615 ± 0.227 (10)	6.998 ± 0.336 (8)
VI	18.933 ± 1.530 (4)	7.203 ± 0.422 (4)

(Figures within paranthesis indicate the number of animals involved)

Statistical analysis revealed that there was no significant difference in mean fibre diameter between different age groups. Similarly mean staple length between different age groups was also found non significant.

Using Sandar's method, repeatability co-efficient was estimated and it was 0.295 for fibre diameter and 0.639 for staple length.

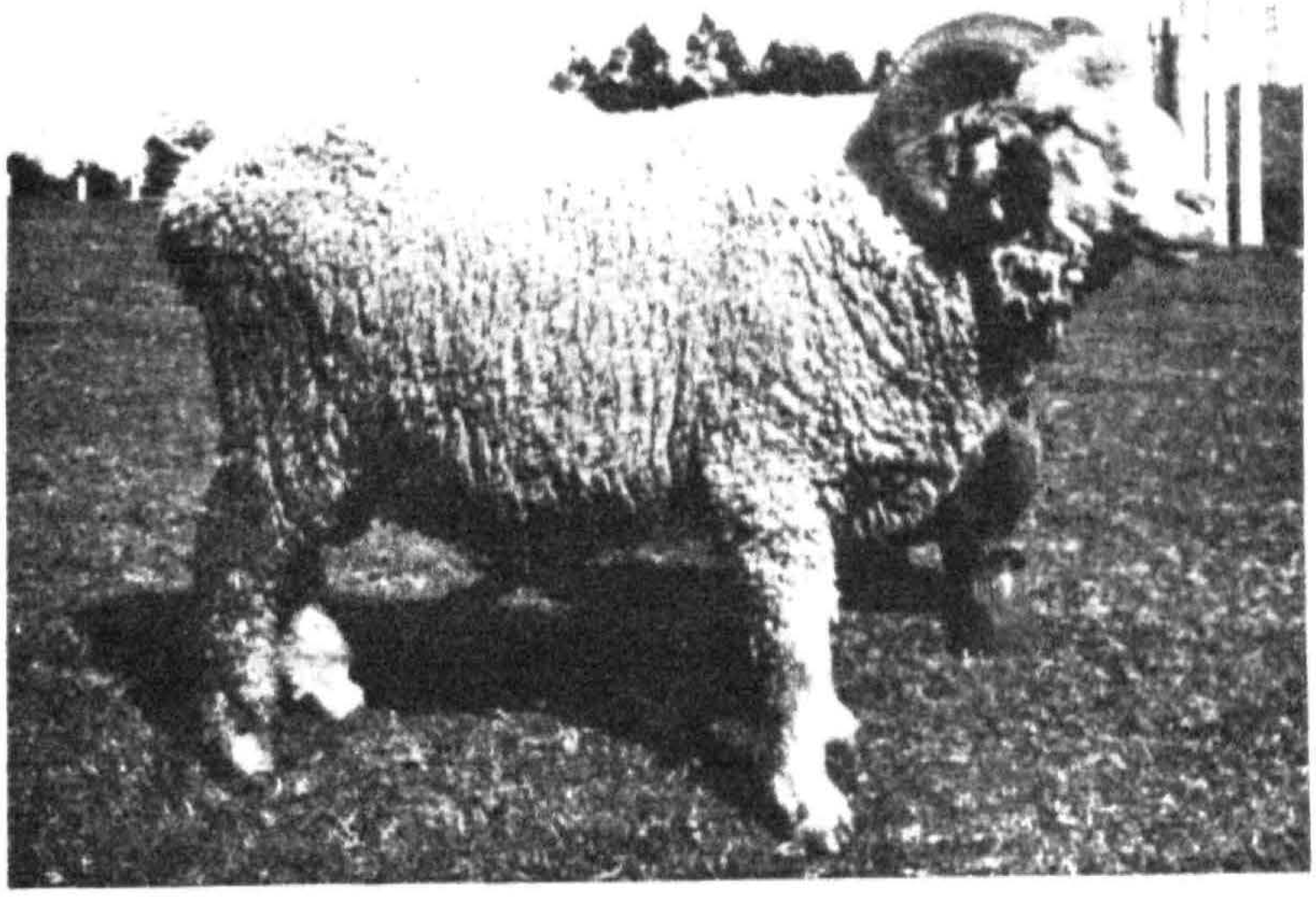
Wool fibre diameter and staple length of Merino (s) and Merino-Nilagiri crosses : The sheep available during annual shearing season (March/April 1979) were analysed age group wise for diametre and length of the fibre and the details are presented in Tables 142 and 143.

TABLE 142. Wool fibre diameter and staple length of Merino breed

	Breed : Merino (Stavropol)					
Age	Fibre diameter (in micron)			Staple length (in cm)		
(in years)	Mean ± S.E.		COV in %	Mean ± S.E.		(COV in %)
I	18.060 ± 0.176	(102)	9.75	7.951 ± 0.100	(98)	12.45
II	19.619 ± 0.234	(54)	8.75	9.466 ± 0.188	(54)	16.29
III	19.547 ± 0.243	(63)	9.85	7.747 ± 0.132	(63)	13.54
IV	18.981 ± 0.209	(51)	7.86	7.873 ± 0.145	(51)	13.11
V	19.680 ± 0.422	(14)	8.40	6.860 ± 0.244	(14)	13.31
VI & above	19.205 ± 0.145	(173)	9.95	7.488 ± 0.084	(172)	14.77

(Figures within brackets indicate the number of animals)

Plate 48 "SANDY" SHEEP



On statistical analysis, highly significant differences ($P<0.01$) between the different age groups in mean fibre diameter was observed. Minimum fibre diameter of of 18.060 ± 0.176 microns was observed at first year of age and maximum of 19.680 ± 0.422 microns was observed at fifth year. It could be further observed that as age advances, the quality of wool becomes coarser than what it was at first year. Co-efficient of variation varies from 7.86% to 9.95% at IV and VI year respectively. Similarly highly significant differences ($P< 0.01$) between different age groups in mean staple length were observed. Maximum staple length of 8.466 + 0.189 cm was observed at II year of age. Staple length had an increasing trend upto II year of age, and thereafter started declining, reaching the lowest (6.860 ± 0.244) at V year of age. Co-efficient of variation varies from 12.45% to 16.29%. Maximum variation was observed at II year of age.

TABLE 143. Wool fibre diameter and staple length of Merino-Nilagiri crossbreed

Age (in years)	Breed : Merino - Nilagiri (Crossbred)			
	Fibre diameter (in micron)		Staple length (in cm)	
	Mean ± S.E	COV (in %)	Mean ± S.E	COV (in %)
I	20.333 ± 0.235 (66)	9.41	7.468 ± 0.168 (38)	13.85
II	21.436 ± 0.189 (50)	6.23	7.742 ± 0.132 (45)	11.47
III	22 384 ± 0.355 (27)	8.24	7 406 ± 0 273 (27)	19.15
IV	21.796 ± 0.214 (28)	5.19	7.450 ± 0.202 (28)	14.32
V	21.587 ± 0.275 (21)	5.84	6.808 ± 0.201 (21)	13.54
VI & above	21.269 ± 0.225 (41)	6.77	6.665 ± 0.172 (41)	16.52

(Figures within parantheses indicate the number or animals involved)

On statistical analysis, highly significant differences ($P<0.01$) between different age groups in mean fibre diameter were observed. Minimum mean fibre diameter of 20.303 + 0.235 microns was observed at first year of age. This finding is in accordance with the findings observed in the Merino (Sravropol) breed. It could be further observed that fibre diameter had an increasing trend upto three years of age and thereafter started declining reaching a diameter of 21.269 + 0.225 microns at five years and over. Co-efficient of variation varied from 5.19% to 9.41% at fourth and first years respectively.

Highly significant differences ($P< 0.01$) between different age groups in mean staple length were observed. Maximum staple length of 7.742 + 0.132 cm was observed at second year of age. This finding is

Rice polish as replacer of maize in starter mash : Fresh good quality rice polish could replace maize upto 40% in the chick ration (0-8 weeks). Where rice polish was included at 20% and 30% levels in place of maize, rice polish was found to be more efficiently utilised ingredient than maize.

Cheap poultry feed : In order to find out some cheap substitutes for poultry feeds, the proximte composition of fruit peels and seeds of some avenue trees was analysed. Mango kernel was found to contain a high percentage (83%) of carbohydrate. The seeds of *Gliricidia maculata* had a very high protein content (39.4%) but it could not be used as a substitute feed since it was found to have a high crude fibre content (35%).

A cheap poultry feed containing powdered seeds of *Enterolobium saman* was devised and fed to poultry. A decrease in egg production was observed with increasing amounts of *Enterolobium saman* but when the autoclaved seeds were used, the egg production was found to be not affected.

Mineral mixture in the growth of broiler chicks : There is no significant growth rate with the addition of increased level of mineral mixture for rapidly growing broiler chicks. The weight at 8 weeks for the control group and treated group of 3% and 4% were 1.356 kg, 1.125 kg and 1.294 kg respectively.

Influence of Live' 52 on the growth rate of broiler chicks : Two hundred day-old-randomly selected Samrat broiler chicks were used for studying their performance regarding the meat production. They were divided into two groups. The control group was given starter and finisher ration without the addition of Liv' 52. The experimental group was given starter and finisher ration with the addition of Liv' 52 at 0.1% level (1 gram in one kg of feed). The group fed with Liv' 52 showed an average increase of 81 g which was statistically significant.

Control of ectoparasites of poultry : To formulate an effective control of ectoparasites of poultry, three chemical insecticides viz. Zolone, Sumithion and Sevin wettable powder and a bazaar drug (vasambu) *Acarous calamus* were tried on birds infested with ectoparasites. Zolone was found to be 100% effective against feather mites (as 0.25% solution). Sumithion and Sevin wettable powder as 0.5% solution and 0.5% suspension respectively were found to be 100% effective against feather mites. 'Vasambu' was found to be effective against both poultry lice and feather mites as 1% suspension but reinfestation occurred within 4 days. This

drug had no residual effect like chemical insecticides and hence it may be used when chemical insecticides are not available in the market.

Wopell (Indian Herbs and Research and Supply Company) at the dose rate of 1 gm/0.5 kg. body weight, Helmacid (Glaxo) at 0.25 ml/0.5 kg. body weight and Nilverm (ICI) 0.5 gm / 0.5 kg. body weight were found to be very effective against *Ascaridia galli* infection in poultry.

Quality of eggs stored at room temperature through the year: This study was conducted in the department of Poultry Science, Veterinary College, Madras. 60 eggs in two filler flats were stored one above the other under room temperature for 8 days. From each tray 6 eggs at random were taken out for breakout studies at an interval of two days starting from 1st day.

The albumen index and yolk index values got reduced on storage from 0.052 to 0.016 and from 0.390 ta 0.245 respectively. After two days of storage there was a gradual reduction in terms of yolk Index, whereas the reduction was rather drastic in case of albumen index. Yolk colour and shell thickness did not show any variation on storage. However, the moisture loss was least upto 4 days of storage 0.634 g) and it was nearly double during 6 and 8 days of storage (11.364 g).

The maximum albumen index was obtained in September (0.038) followed by January (0.034). The maximum yolk index was obtained in September (0.340) followed by November (0.331) and January (0.323). There was a slight fluctuation in moisture loss from September to January. However, the loss was one and half times more in the months of February indicating the effect due to change of season.

Comparative assessment studies on the preservation of shell eggs : Each month 240 eggs were divided into 4 equal groups for control, oil spraying, oil dipping and thermostabilisation. Eggs were stored under room temperature for 25 days.

During North-east monsoon and winter seasons the loss of moisture was more in the control and thermostabilised groups and was least in the oil dipped and oil sprayed group. Albumen index values in both the seasons were high in the thermostabilised group. But the yolk index was high in oil dipped group than the thermostabilised group in both the seasons.

Studies on the quality of market eggs in the city of Madras: Ten eggs each from wholesale and retail outlets were purchased and both external and internal qualities were studied.

The albumen index and yolk index values did not show much difference between seasons. Yolk colour was less when compared to the standard values. The shell thickness and shell weight were higher in winter.

SWINE

Performance of indigenous pigs under intensive system of rearing : At Livestock Research Station, Kattupakkam, indigenous pigs were reared similar to that of Large White Yorkshires (Exotic) in feeding and management and their growth performances were recorded.

The performance of indigenous pigs was poor as compared to exotic pigs. The present stock of indigenous pigs could not be adapted to intensive system of management. It was very difficult to manage them under indoor conditions. It was concluded that rearing country pigs under intensive system of management is not profitable.

DOGS

Dermatitis in dogs : The various causes of dermatitis and their frequency of occurrence among thh canines attending Madras Veterinary College Hospital were studied. Out of 476 dogs reported 76 cases were due to specific causes. The major specific causes were Demodetic mange, Sarcoptic mange, Dermatomycosis and Ascariasis recording 42.0, 6.6, 35.6, 15.8% respectively

Out of the rest of 400 cases, 15.5% was due to internal parasites, 58 were due to carbolic soap, 12% was due to nutritional deficiency and 20% were due to anal adenitis. Dogs of younger age group were affected more than the aged ones. The incidence of dermatitis in males was atleast twice more than that of females.

Endo-parasitic causes of diarrhoea in dogs : The causes of diarrhoea were analysed in 613 cases and 95.8% cases were due to internal parasitism. The other causes were canine distemper (2.80%) and bacterial enteritis (1.4%). Among 587 cases of internal parasitism, 85.5% of the cause was due to Ancylostomiasis and the other minor causes were Coccidiosis, Giardiasis, Amoebiasis and Taeniasis. Breed, sex and age did not seem to have any influence on the various causes of enteritis.

In cases of Ancylostomiasis anaemia was a marked feature in only about 41% of the cases even though there was a continuous loss of blood due to haemorrhagic enteritis.

FORAGE CROPS

Introduction

Research on forage crops viz., grasses, legumes, cereals and other fodder crops continued to cover various aspects such as crop improvement, management studies and nutritional evaluation. During the year, research thrust was also made on a non-traditional forage source like the tree fodder.

Crop Improvement

Cumbu-Napier hybrids : Evaluation on new hybrids *(Pennisetum typhoides P. purpureum)* resulted in the isolation of three promising cultures viz., TNAU BN 1, TNAU BN 2 and TNAU BN 3. They were found superior to the popular varieties NB 21 and BN 2. (Table 144).

TABLE 144. Performance of green fodder yield of the new hybrids

Variety/Culture	Green fodder yield (t/ha/year)
TNAU BN 1	231.0
TNAU BN 2	220.0
TNAU BN 3	221.6
BN 2	138.6
NB 21	197.4

Lucerne : A new variety of Lucerne (FS 85) developed through mass selection was found superior in yield over the local types and the varieties including Sirsa-9, the All India variety. In view of superiority, selection FS 85 was released as Co 1 during the year 1980 for general cultivation (Plate 49). This has a green fodder yield potential of 85-90 t/ha/year representing an increase of 30% over Sirsa-9. The dry matter and crude protein content of Co 1 variety were 26.66 and 19.80%, respectively (Table 145).

TABLE 145. Performance of culture FS 85

Culture No	1976 - 77 (Sown on 14.12.76)		1977 - 78 (Sown on 9.12.77)		1978 - 79 (Sown on 21.12.78)	
	FS 85	Local	FS 85	Local	FS 85	Local
1.	8229	8126	5589	4651	5302	3966
2.	6229	5554	6937	6057	6514	4834
3.	7817	7360	5531	5086	2777	2171
4.	12286	10983	5120	5063	2674	2434
5.	9417	8537	6560	6046	5657	2783
6.	8011	6537	6880	6320	5451	2823
7.	6891	5383	4834	4809	3520	2480
1.	2846	1543	4069	3451	4115	2972
9.	4251	2457	—	—	6657	5194
10.	5634	3326	—	—	6080	2584
11.	5063	3929	—	—	7646	2937
Total yield	79764	62586	45520	41483	56393	35188
Mean/Cut	6970	5690	5690	5183	5127	3199
Per cent increase over control	22.50%	—	9.60%	—	60.30%	—
Mean plant ht (cm)	59.4	54.6	59.3	55.9	63.2	56.2
Per cent increase	8.6%	—	6.0%	—	12.0%	—
Mean tiller No/metre	28.8	22.6	32.8	29.3	23.8	16.2
Per cent increase	27.0%	—	11.9%	—	56.0%	—

Fodder Sorghum : Interspecific hybridization taken up with *Sorghum halepense* x *S. durra* (Co 11) for the development of high yielding and nutritious forage sorghum strains resulted in the identification of one high yielding culture viz., F Sorg 1. In advanced yield trials, this culture recorded a green fodder yield of of 48.75 t/ha in 55 days representing an increase of 21% over Co 21 and 25% over Co 11 (the standard strains) (Table 146).

TABLE 146. Performance of culture F Sorg 1

Selection	Days to 50% flowering	Green Fodder Yield/t/ha	Crude Protein (%)
F Sorg 1 (*S. halepense* x Co 11)	55	48.75	9.85
Co 11 (Standard)	63	38.94	9.38
Co 21 (Standard)	63	40.31	8.92
K 7 (Standard)	63	40.35	9.54

Plate 49 LUCERN CO.1

Plate 50 LEUCAENA LEUCOCEPHALA

Tree Fodder : *Leucaena leucocephala* : A newly introduced tree fodder crop *Leucaena leucocephala* when tested for its yield potential along with Sithagathi, Agathi and *Desmanthes virgatus* was found to be high yielding. It is also suited both for irrigated and rainfed conditions. (Plate 50). The green fodder yield of *Leucaena leucocephala* and other tree fodder crops are given in Table 147.

TABLE 147. Performance of Tree Fod er

Crop	Green fodder yield t/ha/year	
	Rainfed	Irrigated
Leucaena leucocephala	43	57
Agathi	19	27
Sithagathi	14	32
Desmonthes virgatus	13	39

Five collections of *Leucaena* sp. were evaluated in respect of their fodder yield. In the initial year of establishement (in three harvests) the variety "Hawaiian giant" of *Leucaena laucocephala* recorded 47 t/ha/year of green fodder yield while in others it ranged from 31 to 39 t/ha/year. The Hawaiian giant variety recorded 27.5% of dry matter and 23.7% of crude protein. Forty one collections from divergent sources like Hawaii, Phillipines and Australia have been assembled in the germplasm for selection of high yielding cultures with increased dry matter production.

Nutrition Trials in cumbu - napier hybrids : *In vitro* dry matter digestibility studies taken up with ten selections of Cumbu Napier hybrids synthesised revealed that TNAU BN 1 is better in terms of dry-matter percentage and *in vitro* dry matter digestibility, when harvested on 40 and 50 days intervals. (Table 148).

TABLE 148. Nutrition trials in cumbe-napier hybrids

Variety/Culture	Dry Matter (per cent)		IVDMD (per cent)	
	40th day	50th day	40th day	50th day
TNAU BN 1	16.0	16.5	56.0	46.0
TNAU BN 2	16.0	17.0	52.0	38.0
TNAU BN 3	15.0	16.0	50.0	42.0
NB 21	14.5	19.0	48.0	42.0
BN 2	13.5	19.5	51.0	44.0

Grass-legume mixture in Forage production : An experiment was conducted for two years to evaluate the merits of grass-legume mixture with NB 21 grass and Co 1 lucerne. Three levels of nitrogen and phosphorus were tried.

The results revealed that the grass lugume mixture had higher yield than pure stand, This higher production has given a net return of Rs. 3.31, and Rs. 3.42 per day in 1:1 and 2 : 1 ratio respectively while the pure stand recorded Rs. 2.15/day. Grass-legume mixture has increased the crude protein content. The soil fertility status was also enhanced by growing grass-legume mixture. (Table 149).

TABLE 149. Performance of grass - legume mixture

Treatments	Gross production/ha for 20 months	Production per day kg/ha	Net return per ha	Net return per day per ha	Return per rupee
Pure lucerne	186.3	3.11	19061	31.77	1.93
Pure grass	381.7	6.35	24427	40.71	2.15
One row grass + one row lucerne	428.2	7.13	34742	57.90	3.31
Two rows grass + one row lucerne	424.9	7.10	34568	57.61	3.42

Invitro evaluation of legumes and fodder grasses : The most ideal cutting interval for dry matter digestibility and crude fibre content was estimated by *invitro* evaluation of legumes (lucerne, sunhemp and cowpea) fodder grasses (NB 21, Napier grass and paragrass). Higher dry matter digestibility and lower crude fibre content was noticed when the cutting interval of these forages was 20 days.

❋ ❋ ❋

Soil Physical Properties

Organic amendments in improving the soil physical properties : To evaluate the relative efficacy of organic amendments such as sugarcane begasse, groundnut husk. green manure, farm yard manure and pig manure at 10 t/ha on the physical properties of soils and yield of crops, field experiment was conducted in red sandy loam soil with Sorghum (CSH 5) as test crop. Pig manure and farm yard manure treatments at 10 t/ha significantly improved the physical properties of soil like hydraulic conductivity, aggregate stability, stability index and total porosity, than other treatments. Pig manure was significantly superior to other organic amendments in improving the grain and straw yield of sorghum, while farm yard manure and green manure were equally effective and superior to groununut husk and sugarcane begasse (Table 150)

TABLE 150. The effect of different organic amendments on physical properties of soil and yield of sorghum

Treatments	Hydraulic conductivity (cm/hr)	Aggregate Stability (%)	Stability index	Total porosity (%)	Sorghum yield (kg/ha) Grain	Strow
Sugarcane begasse at 10 t/ha	5.87	39.65	35 2	62.25	3530	12810
Farmyard manure at 10 t/ha	9.67	41·80	36.3	64.25	4630	13650
Groundnut husk at 10 t/ha	8.05	37.10	32.7	62.25	3720	12860
Pig manure at 10 t/ha	11.02	43.65	39.9	64.75	5480	14480
Green manure at 10 t/ha	6.92	40.90	34.4	60.50	4220	13310
Control	4.65	34.45	27.3	59.50	3080	10930
S.Eo	0.58	0.77	0.83	0.35		
C.D	1.22	1.65	1.76	0.73		

Effect of mixed cropping of cereals and pulses on the physical properties of soil : An experiment was conducted in red sandy loam soil (Palathurai series) with the following treatments to compare the effect of mixed cropping and monocropping on the physical properties of the soil.

T_1 — Maize (Ganga 5)	Mono-cropping	T_5 —	Maize plus Lab-Lab - Mixed crop
T_2 — Sorghum (Co 23)	Mono-cropping	T_6 —	Maize plus cowpea - Mixed crop
T_3 — Lab-Lab (Co 9)	Mono-cropping	T_7 —	Sorghum plus Lab-Lab - Mixed crop
T_4 — Cowpea (Co 3)	Mono-cropping	T_8 —	Sorghum plus cowpea - Mixed crop

Mixed cropping of cereals like maize (Ganga 5) with pulses (Co 3) and lab-lab (Co 9) was more efficient in improving the physical properties of soil such af hydraulic conductiviry, total and capillary porosity than mono-cropping system. Mixed cropping of maize with cowpea and lab-lab were equally effective in improving the yield (Table 151).

TABLE 151. Effect of Mixed cropping on soil physical properties

Treatments	Aydraulic conductivity (cm/hr)	Total Porosity (%)	Cappillary Porosity (%)	Yield (kg/ha)
Maize (Ganga 5) -Mono-cropping	9.23	56.8	35.7	2433
Sorghum (CO 3) - Mono-cropping	9.69	55.9	34.8	2900
Lab-lab (CO 9) - Mono-cropping	8.19	56.4	35.9	1333
Cowpea (CO 3) - Mono-cropping	8.78	55.3	34.6	900
Moize+Lab-Lab - Mixed crop	9,93	58.1	36.3	1167
Maize+Cowpea - Mixed crop	9.43	57.8	36.8	1267
Sorghum+Lab-Lab - Mixed crop	9.98	58.4	37.1	1800
Sorghum+Cowpea - Mixed crop	10.83	59.1	37.6	2233
SE	0.288	0.32	0.41	
CD	0.865	0.98	1.24	

Soil Fertility and Plant Nutrition Management

Long term Fertilizer Experiments : With the continuous use of various agricultural chemicals viz., fertilizers, pesticides, fungicides, herbicides, with sole aim of increasing the crop yields, it could be expacted that the soil, a complex system might intract with these chemicals and bring about favourable or harmful etfects in the soil. These may result in changes in soil physical, chemical and biological properties, besides affecting crop yields over a period of time. Hence it becomes essential to monitor the

change in the soil resulting from continuous use of heavy doses of fertilizers etc, under intensive cropping. A long term fertilizer experiment has been started in 1972 with treatments as indicated in the table with Ragi-Cowpea-Maize as the cropping system.

The mean yields of three crops grown since1972 are summarised and presented in Table 152. The control plot has recorded the lowest yields in all the three crops followed by N alone treatment. The crop yields in N plot clearely showed that higher yields can not be obtained by applying only nitrogen. The yield was found to increase nearly 2 to 3 times when N and P are applied indicating the need for combined application of N and P.

TABLE 152. Long term fertilizer experiments mean yield of three crops raised from 1972.

Treatment	Ragi		Cowpea		Maize	
	grain	straw	grain	straw	graie	straw
50% OPT NPK + PPC	19.8	41.2	5.6	14.2	14.4	51.9
100% OPT NPK + W+PPC	23.8	51.1	5.6	15.4	18.0	56.6
150% OPT NPK + W+PPC	26.5	60.5	6.2	16.5	20.7	61.4
100% OPT NPK + HW + PPC	26.9	51.5	5.8	14.6	18.5	54.7
100% OPT NPK + W+PPC $ZnSO_4$	24.9	54.2	5.9	14.9	20.0	57.2
100% OPT NP + W+PPC	26.2	50.0	5.7	14.1	18.6	55.3
100% OPT N + W + PPC	9.9	24.6	3.3	9.3	4.1	27.7
100% OPT NPK + W +PPC+FYM	30.5	69.2	6.7	20.8	23.2	63.4
100% OPT NPK+W+PPC (S free)	24.7	57.4	6.5	17.3	19.4	60.9
Control	7.1	18.7	2.8	7.2	2.7	17.2

Soil test-crop response correlation studies and fertilizer recommendation : Soil test crop respoese correlation studies are being carried out on different crops such as rice, sorghum and groundnut with a view to determine the optimum fertilization schedule for these crops based on soil test values so that there could be a prudent use of fertilizers leading to maximum benefits. Based on the results specific recommendations could be given for desired yield targets. (Table 153 through)

TABLE 153. Nitrogen, Phosphorus and Photassium Requirement of rice IR 20 in kg/ha for different yield targets with varying soil test values - Alluvial Soil - Noyyal Series

Soil test values for			Targetted yields q/ha								
			45			50			55		
Avail. N	Avail. P	Avail. K	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
50	5	50	334	47	129	374	54	145	414	61	160
100	10	100	311	29	124	351	36	140	391	43	155
150	15	150	288	10	118	328	17	134	369	24	149
200	20	200	265	—	113	305	—	129	345	5	144
250	25	250	245	—	107	285	—	123	325	—	138
300	30	300	219	—	102	259	—	118	299	—	133
—	—	350	—	—	96	—	—	112	—	—	127
—	—	400	—	—	91	—	—	107	—	—	122
—	—	450	—	—	85	—	—	101	—	—	116
—	—	500	—	—	80	—	—	96	—	—	111
—	—	550	—	—	74	—	—	90	—	—	105
—	—	600	—	—	69	—	—	86	—	—	100

TABLE 154. Nitrogen, Phosphorus and Potassium requirement of Rice Bhavani in kg/ha different yield targets with varying soil test values - Alluvial soil - Noyyal series

Soil test values for			Yield targets q/ha								
			40			45			50		
Avail. N	Avail. P	Avail. K	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
50	5	50	142	82	40	164	96	46	186	111	54
100	10	100	109	52	23	131	66	30	153	81	38
150	15	150	75	21	7	97	35	14	119	50	22
200	20	200	42	—	—	64	5	—	86	20	5
250	25	250	8	—	—	30	—	—	52	—	—
300	30	300	—	—	—	—	—	—	18	—	—

TABLE 155. Nitrogen, Phosphorus and Potassium requirements of Rice IR 20 in kg/ha for different yield targets with varying soil test vaules - Aduthurai soil (Kalathur series)

Soil test values for			Targetted yield q/ha								
			45			50			55		
Avail. N	Avail. P	Avail. K	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
50	5	50	296	10	106	332	15	119	369	20	132
100	10	100	263	—	97	299	—	110	336	—	123
150	15	150	230	—	88	266	—	101	303	—	114
200	20	200	197	—	79	233	—	92	270	—	105
250	25	250	164	—	70	200	—	83	237	—	96
300	30	300	131	—	61	167	—	74	204	—	87

TABLE 156. Nitrogen, Phosphorus and Potassium requirements of Sorghum CSH 5 for different yield targets with varying soil test values - Red soil (Irugur series)

Soil test values for			Yield targets q/ha								
			45			50			55		
Avail. N	Avail. P	Avail. K	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
50	5	50	122	27	224	138	31	250	153	34	277
100	10	100	108	23	203	124	26	228	139	30	255
150	15	150	94	18	181	110	22	207	125	25	234
200	20	200	80	14	160	96	18	185	111	21	212
250	25	250	66	10	138	82	13	164	97	17	191
300	30	300	52	5	117	68	9	142	83	12	169
350	—	350	38	—	95	54	—	121	69	—	148
400	—	400	24	—	74	40	—	99	55	—	126
—	—	450	—	—	52	—	—	78	—	—	105
—	—	500	—	—	31	—	—	56	—	—	83

TABLE 157. Nitrogen, Phosphorus and Potassium requirements of Groundnut - POL 2 (kg/ha) for different targetted yields with varying soil test values-Red soil (Irugur series)

Soil test for			Targetted yields q/ha								
			15			20			25		
Avail. N	Avail. P	Avail. K	N	P_2O_5	K_2O	N	P_2O_5	K_2O	N	P_2O_5	K_2O
50	5	50	54	39	177	77	62	161	100	86	207
100	10	100	40	7	98	63	31	143	86	54	188
150	15	150	25	—	80	48	—	124	71	22	170
200	20	200	11	—	61	34	—	106	57	—	151
250	25	250	—	—	43	19	—	88	42	—	123
300	30	300	—	—	24	5	—	69	28	—	114
350	—	350	—	—	6	—	—	51	13	—	96
400	—	400	—	—	—	—	—	32	—	—	77
—	—	500	—	—	—	—	—	—	—	—	40

AGRO CLIMATOLOGY

Seasonal distribution of rainfall in different parts of Tamil Nadu is given in Fig. 23.

Rainfall was analysed in detail for selected taluks of Tamil Nadu and basedon the rainfall pattern and soil types, suitable cropping systems are suggested. The objective of this scheme is to stabilise the crop production in rainfed areas and to reduce the risk due to vagaries of monsoons. Modified cropping systems involving new crops and new varieties were contemplated in this scheme and suggested cropping systems for rainfed areas of Coimbatore district based on rainfall distribution is presented in Table 158. Meteorological data for Coimbatore Centre are presented in Fig 24.

In Pollachi taluk, the existing cropping system in rainfed area is to grow POL 2 bunch groundnut followed by local fodder sorghum. Co 1 bunch groundnut was suggested to be grown mixed with pulses like Co 4 blackgram or Co 3 greengram. After harvest of groundnut, IS 3541 sorghum is recommended as a mixture with Co 3 cowpea or Co 9 lab-lab. In the place of sorghum, Ganga 5 maize can be introduced as a pure crop for grain purpose. Varalakshmi cotton can be successfully grown as a pure crop under rainfed conditions.

In Coimbatore taluk, only one crop of sorghum is grown during October. Whenever there is sufficient summer showers it may be utilised for growing pulses like blackgram or greengram. Growing long duration Co 1 sorghum is recommended with the onset of South West monsoon in June - July. If the South West Monsoon is a failure then short duration sorghum like Co 24 mixed with Co 3 redgram may be taken up in black soil area from September onwards. If the monsoon is delayed further, then Co 1 bengalgram may be sown in November.

In Palladam taluk, sorghum IS 3541 may be raised with Co 3 cowpea or Co 9 lab-lab or Co 3 redgram. In delayed monsoon period, Co1 bengalgram mixed with wheat types like HD 2189 will be a profitable crop pattern in black soil areas.

In Mettupalayam taluk, Co1 groundnut mixed with cowpea or lab-lab may be grown during September - October in red sandy soils. In certain parts of this taluk where rains are received during July - August, Co 24 sorghum mixed with lab-lab or redgram may be grown for grain purpose in red loamy soils. When the rains are received late by September, IS 3541 sorghum may be grown mixed with dewgram for fodder purposes.

FIG.23 RAINFALL PATTERN IN TAMIL NADU — 1979

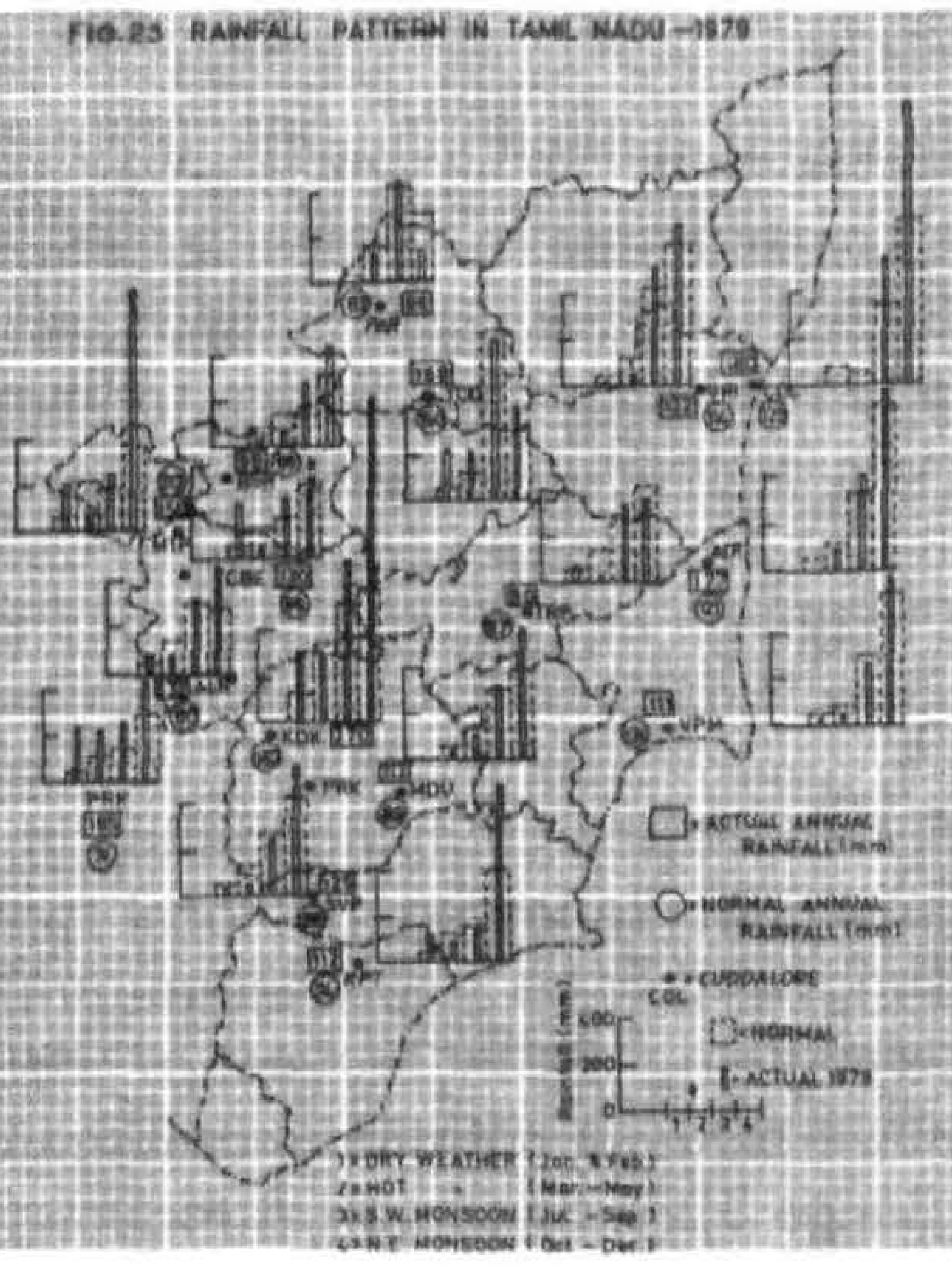


FIG.24 METEOROLOGICAL DATA FOR COIMBATORE CENTER 1979 (WEEKLY AVERAGE)

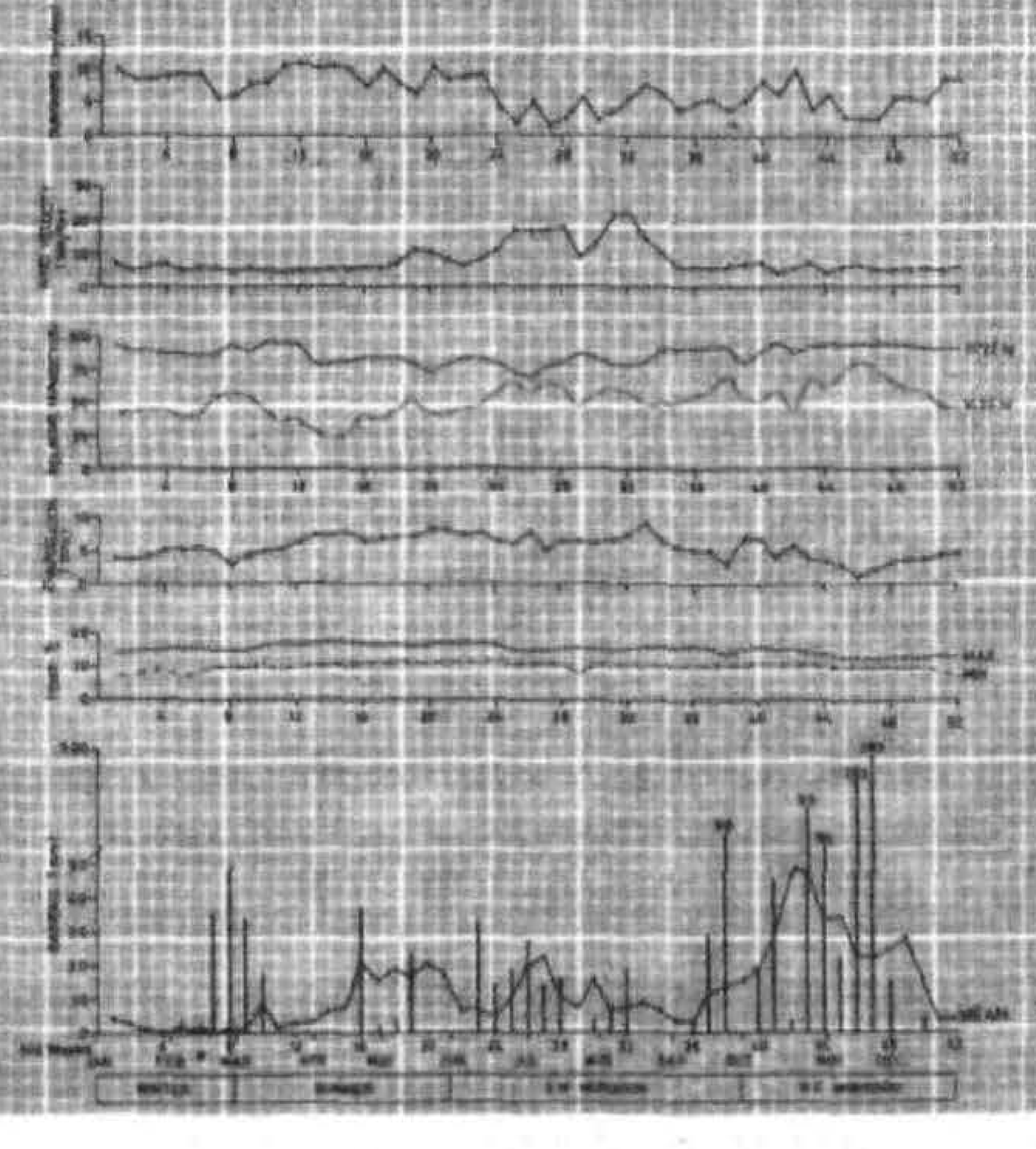
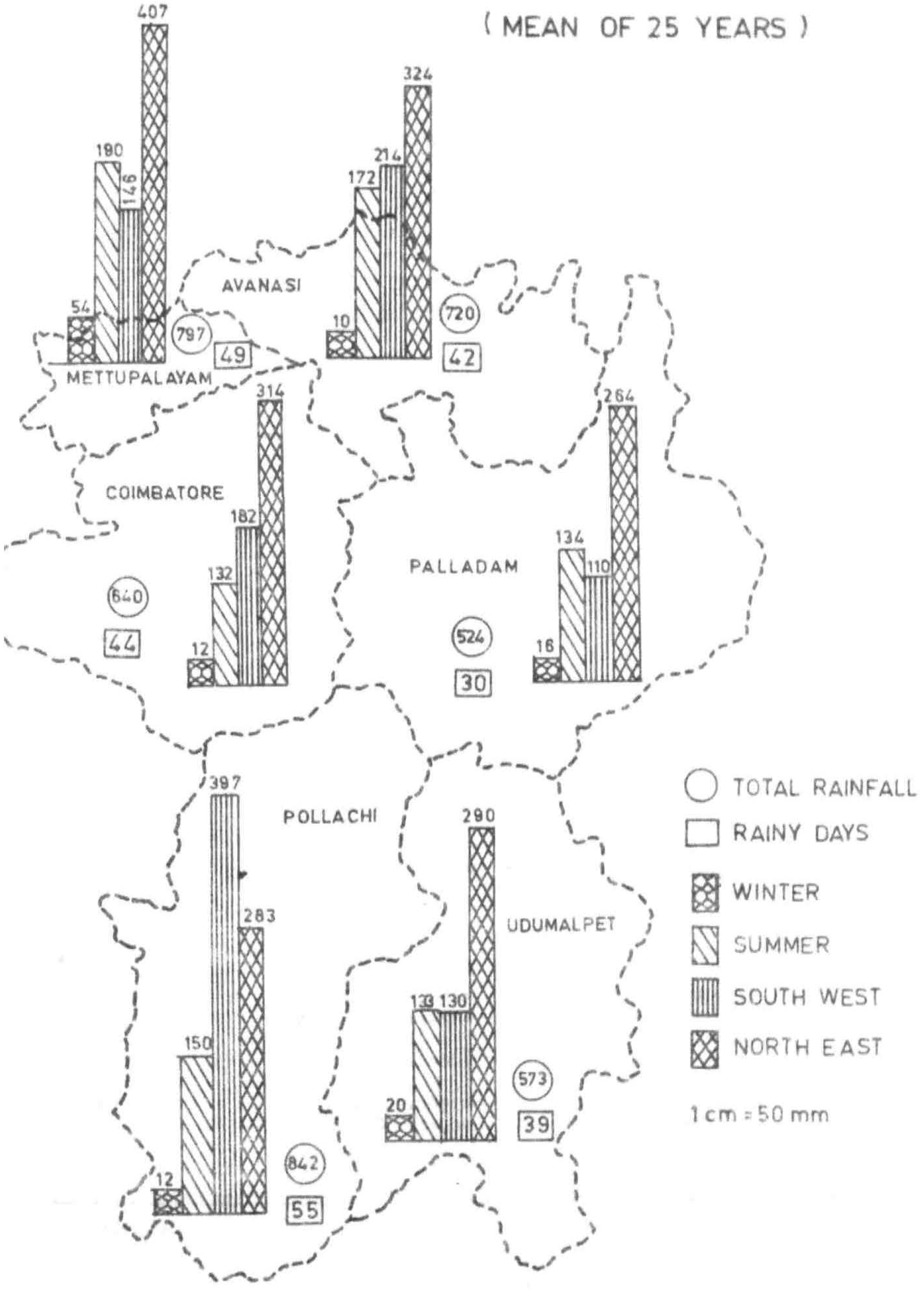


Fig: 24 A

RAINFALL PATTERN - COIMBATORE DISTRICT

(MEAN OF 25 YEARS)



In Udumalpet taluk, IS 3541 sorghum may be sown mixed with cowpea or lab-lab or Co 1 soybean with the receipt of rains during October in black soil areas. In case of delayed monsoon, bengalgram mixed with HD 2189 wheat may be a profitable one.

In Avanashi taluk, with the receipt of summer showers(March-April) TMV 6 gingelly can be grown successfully. After harvest of gingelly, Co 1 groundnut mixed with blackgram or greengram may be grown. After harvesting groundnut a catch crop of Co 1 horsegram may be sown utilising the residual moisture in red soil areas. In red gravelly soils, Co 1 sorghum mixed with cowpea or lab-lab may be suggested.

In rainfall climatology, attempt is being made to predict the rainfall for Coimbatore using ARIMA statistical technique.

TABLE 158. Suggested cropping systems for rainfed areas of Coimbatore District based on rainfall pattern

Taluks (1)	Cropping system (2)			Remarks (3)
1. Pollachi (Red sandy oils)	G. Nut (POL 2) (April - Aug.)	—	Sorghum local (Aug. — Jan.)	Existing cropping system
	G. Nut (Co 1) + Blackgram (Co 4) (or) Greengram (Co 3) (April - Aug)	—	Sorghum (IS 3541) + Cowpea (Co 3) or lab-lab (Co 2) (Aug. - Jan.)	Proposed
	G. Nut (Co 1) + (or) Greengram (Co 3) (April - Aug.)	—	Cotton (Varalakshmi)	Proposed
2. Coimbatore(Red sandy oils)	Sorghum (local mixed with pulses) (October - January)			Existing
	Blackgram (Co 4) (or) Greengram (Co 3) (April - June)	—	Sorghum (Co 1) with mid term correction (June - January)	Proposed
	Blackgram (Co 4) (or) Greengram (Co 3) (April - June)	—	Sorghum (CSH 8) + Redgram (Co 3) (Sept. - Jan.)	Proposed

[Contd.]

(1)	(2)	(3)
(Black soils)	Sorghum (local mixed with pulses (October - January) (or) Bengalgram (local) (Nov. - Jan.)	Existing
	Sorghum (CSH 8) + Redgram (Co 3) (Sep. - Jan.) (or) Wheat (HD 2189 + Bengalgram (Co 1) (Ocr. - Nov. - Jan.) (When monsoon delayed)	Proposed
3. Palladam (Black soils)	Sorghum (local) (Oct. - Jan) Bengalgram (local) (In delayed monsoon) (Nov. - Jan.)	Existing
	Sorghum (IS 3541) or Cowpea (Co 3) or lab-lab (Co 9) or redgram (Co 3) (Oct. - Jan.) or Bengalgram (Co 1) + (OR) Wheat (HD 2189) (Nov. - Jan.) (In delayed monsoon)	Proposed
4. Mettu-palayam (Red sandy soils)	G. Nut (TMV 2) pure crop (Sep. - Dec.)	Existing
	G. Nut (Co 1) + Cowpea (Co 3) or lab-lab (Co 9) (Sep. - Dec.)	Proposed
(Red loamy soils)	Sorghum (local) mixed with pulses (July - December)	Existing
	Sorghum (Co 24) + Redgram (Co 3) or lab-lab (Co 9) (July - Aug. to December) or Sorghum (IS 3541) + dewgram (Sept. - Jan.) (In delayed monsoon)	Proposed

[Cont d.]

Pest incidence in mulberry and their management: Mulberry plants were infected by thrips (*Thrips flavus*), scales (*Pulvinaria maxima*), mealy bug, (*Phenococcus hirsutus*), chafer grub beetle (*Anomala dorsata*) and cerambycid beetle (*Sthenias grisator*) during various months. The damage caused by the adult. *Anomala dorsata* on the foliage of mulberry was recorded for the first time in South India. The result of the field experiments conducted to control both the thrips and scales by using different chemicals revealed that the chemical control is not a suitable method for this crop, since the residual effect was noted even upto 12 - 15 days. It was observed that the systematic pruning of the crop can save the mulberry from the pest attack.

Performance of different races of silkworms: Among the 35 races of silkworms (*Bombyx mori* L.) tried, the parents *viz.,* Pure Mysore, Hosa Mysore, C-Nichi, Kalimpong A, Kalimpong B, C-108, J-122, NN6D and the hybrids *viz.,* TY 3 x J. Kali, TY4 x J. Kali, T5 K4x CNC; Kgl x Kal A, Kgl x Kp; K x CCY x J-122, K x CNC and KA x NN6D were found suitable for rearing under Coimbatore conditions. Among the pure races the cocoon yield was 20 kg/100 DFLS in Pure Mysore; 25 kg / 100 DFLS in Hosa Mysore and C-Nichi; 30 kg/100 DFLS in Kalimpong B, C 108, and J. 122, and 35 kg/100 DFLS in Kalimpong A and NN6D and among the hybrids it was 35-40 kg/100 DFLS in Ty 3xJ. Kali, Ty 4 x J. Kali, T5K 4 x CNC; Kg lx Kal-A, Kgl x Kp; K x CCY x J-122; 40 - 45 kg/100 DFLS in K x J.122 and 45 - 50 kg/100 DFLS in KA x NN6D.

Mutation studies on silkworm: Gamma irradiation techniques was adopted and KA eggs were irradiated. Two selective lines U 5 and U 8 were isolated.(Plate 51).The percentage of hatching, larval weight, cocoon weight shell weight, filament length and silk weight over the control ranged from 4.02 to 5.6; 6.67 to 9.80; 6.5to7. 3;18.6 to 25.1;13.0to 18.0, 36 to 41 respectively among these lines. Renditta was also less in these two lines which indicates the high silk content. (Table 161).

PLATE: 51 U 5 AND U 8
MULBERRY SILK WORMS

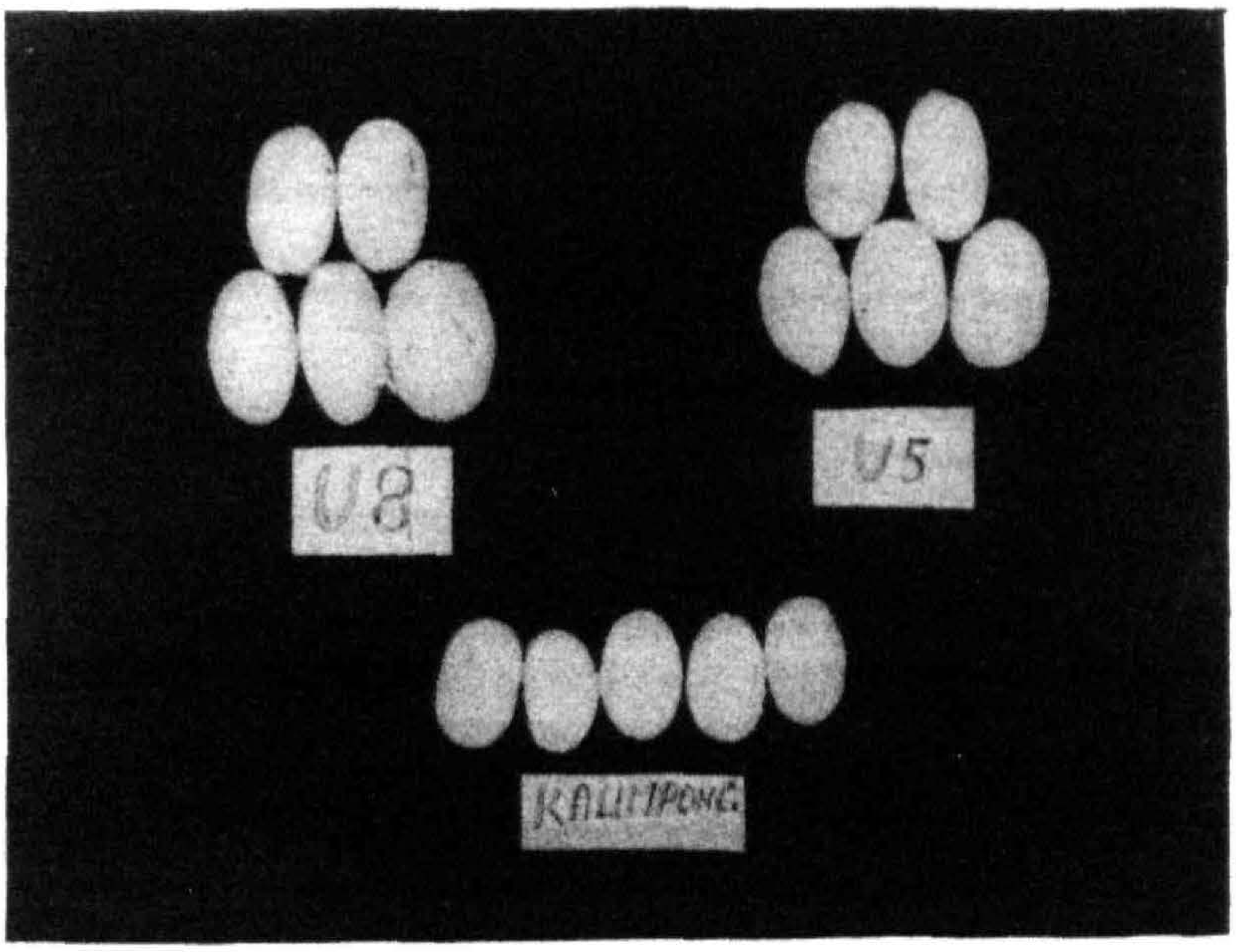


TABLE 161. Data on the performance of two lines U5 and U8 evolved through gamma radiation of Kalimpong A

(Mean of 16 generations)

Line	Hatching %	Larval Wt. (g./ larvae)	Cocoon Wt. (g./ cocoon)	Shell Wt. (mg/ cocoon)	Shell %	Filament length in (m/cocoon)	Silk Wt. (mg/ cocoon)	Renditta
U 5	89.85	2.720	1.320	202.69	15.89	804.19	180.77	7.19
U 8	88.50	2.800	1.310	213.69	16.25	841.94	187.23	6.85
Control (Kalimpong A)	85.08	2.550	1.230	170.81	13.49	712.81	132.92	9.20
Significant	Yes	N.S.	N.S.	Yes	Yes	Yes	Yes	Yes
S.E.	0.926	—	—	9.44	0.522	18.999	9.129	0.249
C.D.	2.64	—	—	26.88	1.49	53.11	26.18	0.705

Sericin content in cocoons: Estimation of the sericin i.e., the soluble protein present in silk of different races and hybrids under Coimbatore conditions revealed that the sericin content is comparatively high in hybrids ranging from 29.79 to 31.05%. Among the pure lines, the sericin content is less in Bivoltine ranging from 20.11 to 23.97% whereas in multivoltine, it ranges from 27.39 to 28.69%. (Teble 162).

TABLE 162: Sericin content in different races and hybrids under Coimbatore conditions.

Particulars	Mean of Sericin content	
	Transformed values	Actual values percentage
J. 122	25.76	20.11
KA	30.02	25.01
U5	28.78	23.21
U8	29.63	23.97
Tamil Nadu White	31.58	27.39
Hosa Mysore	32.39	28.69
TW ** x U8 *	32.58	29.00
(H. M ** x C 108 *) ** x CNC *	33.44	31.05
(H. M ** x C 108 *) ** x C 108 *	33.58	30.63
(H. M * x C 108 **) ** x C 108 *	33.03	29.79
Significant	Yes	
S. E.	1.054	
C. D.	2.532	

* Male

** Female

Possibilities of rearing Eri silkworm in Coimbatore condition : Eri silkworm eggs were received from Assam during July 1979. They were acclamatised to Coimbatore condition and later selected for pureline. They were initially fed with castor leaves and then maintained subsequently on tapioca leaves. The diets were tested on these worm and a suitable artificial diet was developed. (Plate 52).

The composition of the artificial diet consisted of leaf powder, 6gms; Parched Soyabean Powder, 1gm; Sucrose, 1gm; Agar agar, 1gm; Streptomycin sulphate, traces and distilled water, 50 ml. The tapioca leaves were shade dried, powdered and the five materials passed through ISI : 44 mesh sieve. The leaf powder along with other ingredients was mixed well in water, heated over a flame till it boiled gently and then allowed to solidify at room temperature and stored in a frigidiare. The prepared materials was sliced into thin stripes and the worms were fed on them.

Preliminary observations were made, with 25 number of one-day old larvae in petri dishes. In order to confirm the acceptability another set of studies were made with third stages larvae in similar manner. Five replicates of 25 larvae in each were maintained on the diet. The performance of the larvae on the artificial diet was compared with the bulk population of 250 larvae maintained on tapioca leaves. The required larvae for the experiments were taken from the brushing of the same day.

The larvae fed on the diet did not differ in general from those fed on the leaves both in body size and larval duration but in body colour differed from those reared on leaves, by remaining white in all the stages. With respect to the shell weight the worms reared in the preliminary studies recorded comparatively low weight (Table 163) which might be attributed to the non-provision of adequate facilities for the worms, to spin cocoons. In the subsequent study the shell weight of the cocoons

Plate : 52 ERI SILKWORM LARVAE
ON TAPIOCA LEAF

obtained from the worms fed on artificial diet was close to the control because straw bits were provided for them as a support to construct cocoons as in control. There was not much signifificiant difference in the case of fecundity between the worms fed on leaves and those on artificial diet. In the sex ratio, the proportion of male moth was more than the females in the population fed on artificial diets than in control.

Preliminary Studies on Erisilkworm with Artificial Diet.

TABLE 163: Mean final larval weight. cocoon characters, moth emergence, fecundity etc.,

	Artificial Diet	Artificial Diet (Mean of 5 replications)	Tapioca Leaves
Final larval weight (gm)	5.24	4.2	4.74
Percentage of cocoons formed	48.0	74.0	48.0
Cocoon weight (gm)	1.86	1.58	1.80
Pupal weight (gm)	1.23	1.47	1.66
Shell weight (gm)	0.17	0.20	0.24
Percentage of moth emerged	83	72	70
Fecundity	127.0	127.8	123.0

APICULTURE

Honeybee Colony Development : The bee colonies were established in four sites in the Tamil Nadu Agricultural University campus viz., Biology Glasshouse, Botanical Garden, Orchard and Paddy Breeding Station. By analysing the honey harvested data from various sites, it is clear that the Paddy Breeding Station and Biology Glass House sites are the best apiary sites where the mean yield of honey/colony/year and mean yield of honey/extraction was 5.737, 5.371 and 0.775 and 0.757 kg respectively. It is also observed the ISI bee hives are the best with respect to honey yield/extraction than Newton bee hives. For the Newton type. the mean yield of honey/extraction ranges from 0.590 to 0.763 kg while for the ISI bee hive it ranges from 0.684 to 0.826 kg.

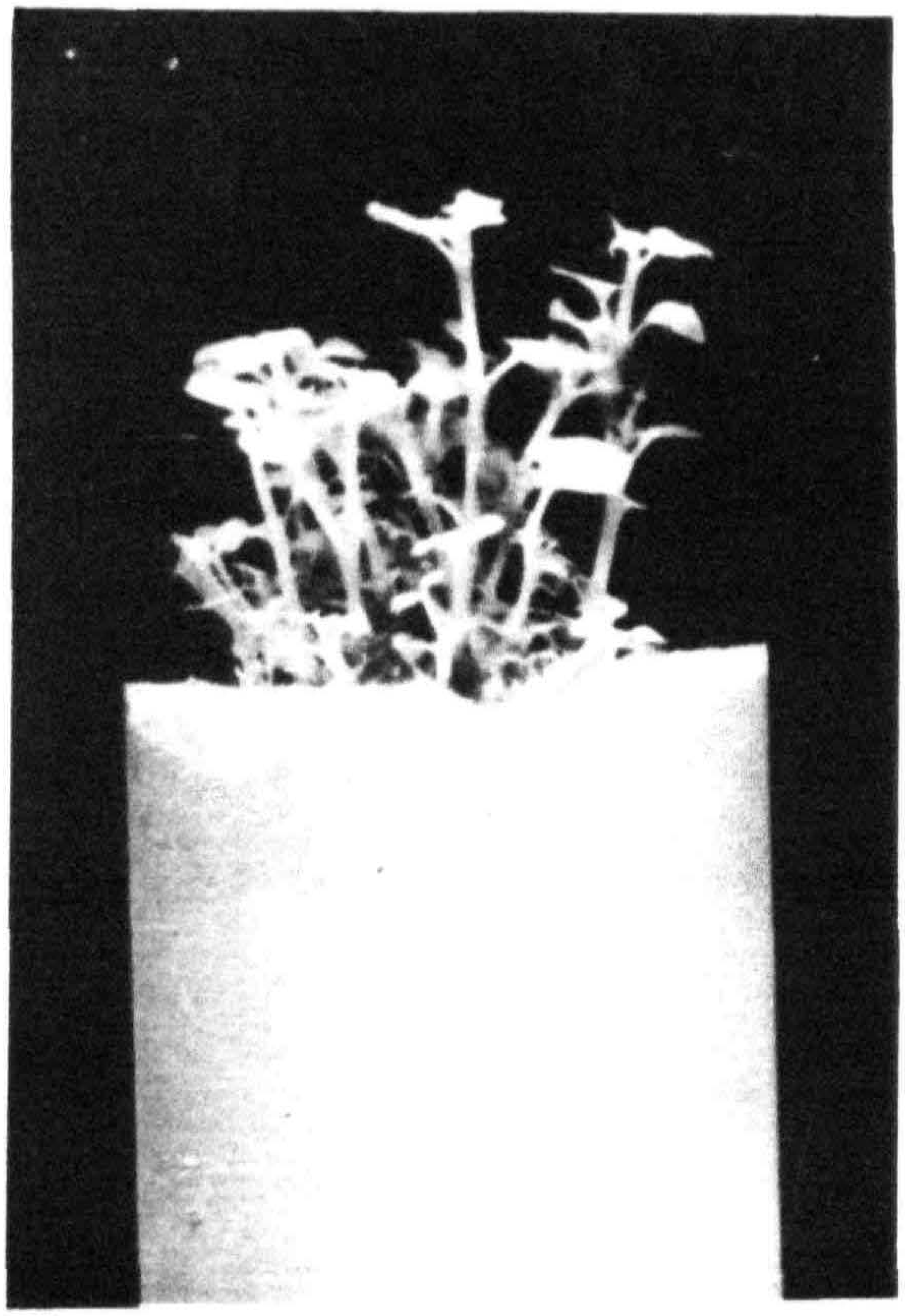
Stability in honey yield was recorded in 14 Newton colonies and 10 ISI colonies. It was found that the mean yield of honey/colony/year and mean yield of honey/extraction for both ISI and Newton hives were 2.257, 2.54 and 0.687 and 0,771 kg respectively.

apical meristem tip culture offers a reliable method for eliminating systemic viral infections it will be advantageous to obtain disease free plants from infected parent stock by culturing the shoot-tips. Hence a method has been standardised for producing large number of healthy plantlets by shoot-tip culture. Shoot-tips measuring approximately 0.5 to 1 mm in length were aseptically dissected and cultured in test-tubes containing Halperin medium (1966) supplemented with 2,4-D (1 mg/l), 6-benzyladenine (0.5 mg/l) and indole-3 acetic acid (1 mg/l) and incubated in a growth chamber with 16 hr photoperiod at a light intensity of 3000 lux (provided by cool, white fluorescent lambs) at 26°C and 70% relative humidity produced callus and multiple shoots in 20 to 25 days. Increasing the concentration of 6-benzyladenine (1-2 mg/l) or 6-furfurylamino purine (2.5 mg/l) in the medium resulted in high proliferation of shoots. In about 25 to 40 days the total number of multiple shoots from a single shoot-tip was as high as 60 - 80. The shoot-tips on transfer to White's liquid medium containing α - nathalene acetic acid (2 mg/l) developed prolific roots in 10 to 15 days. The whole plantlets on transfer to soil in pots and kept in a mist chamber developed into healthy plants. "Plant tests" for Pogostemon virus gave negative reaction showing the absence of virus in these plants. The studies show that patchouly plants have high regenerative capacity and offers a method for culturing healthy plants from shoot-tips and callus cultures. The results also might open up the possibility of rapid propagation of specific genotypes with high essential oil content. (Plate 53).

Regeneration of plantlets in Groundnut : The totipotency of plant cells is well known and it is also clear that the unrestricted expression of totipotence can follow a morphological pathway similar to that taken by the fertilized egg *in ovulo*. The induction of callus from somatic tissues and regeneration of complete plants from unorganized cell systems is useful for the application of cell and tissue culture methods for plant breeding and germ plasm selection experiments done *in vitro*. In the genus *Arachis* L., the totipotency of somatic cells has not been exploited so far with success. A method has been standardised for successful development of callus and regeneration of plantlets in wild peanut *Arahis villosulicarpa* Hoehne). The callus tissue was first developed in Murashige and Skoog medium (1962) supplemented with coconut water (15% v/v) and 2, 4-D (2 mg/l) from leaf explants. The callus on subsequent transfer to fresh MS medium with caesin hydrolysate (100 mg/l) differentiated into whole plants in 6 - 8 weeks. The present study is a potentially valuable tool for genetic manipulation in groundnut crop. (Plate 54).

***

Plate: 53 POGOSTEMON CABLIN
(GROWN FROM CALBUS)



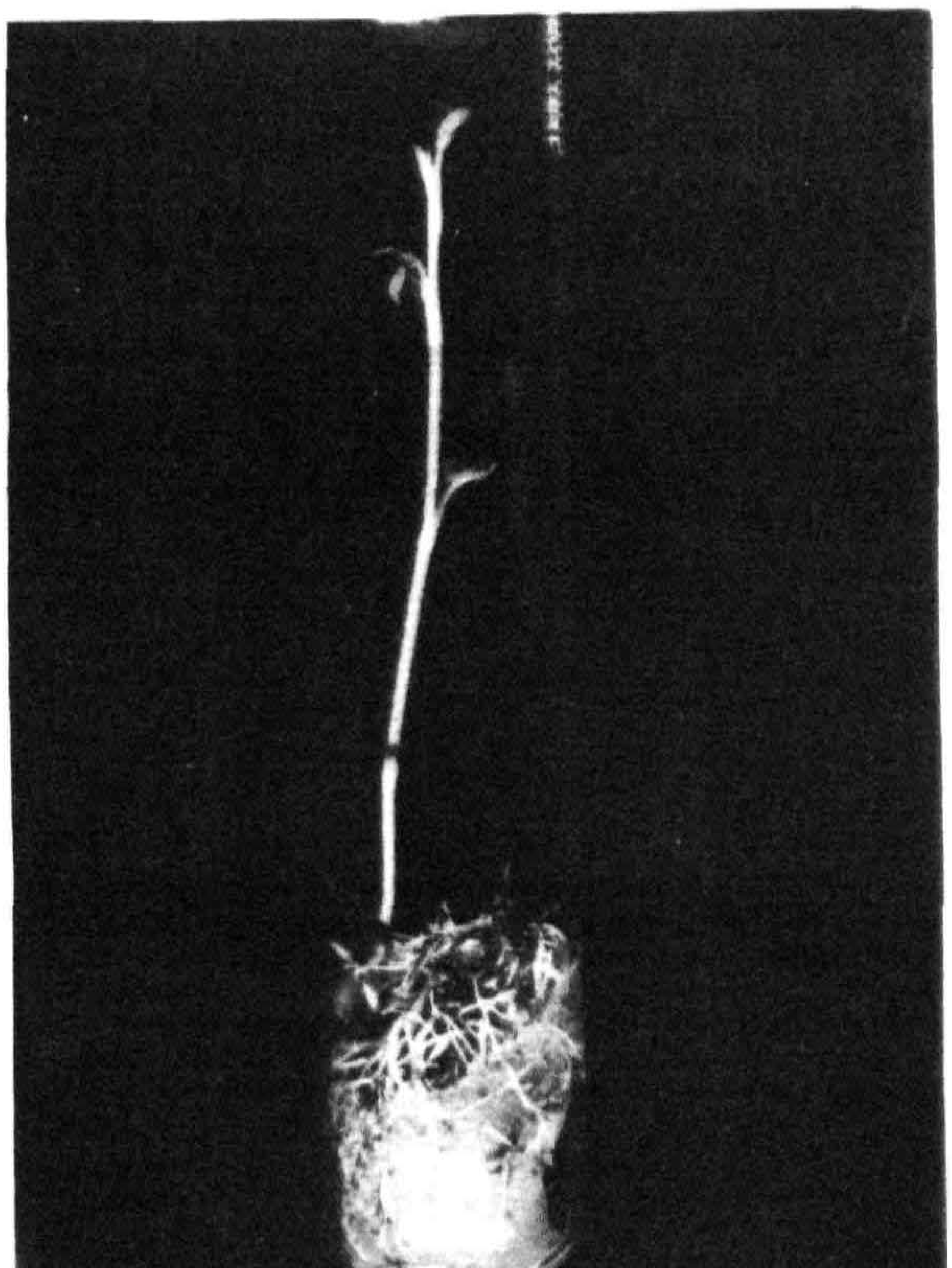


Plate : 54 ARACHIS VILLOSULICARPA
(FROM LEAF CALLUS)

FORESTRY

Eucalyptus

Extensive perambulations of *E. tereticornis* extending over 40,000 acres in Tamil Nadu, has resulted in the identification of six seed stands of desirable germplasm for use as base stock for initiating genetic improvement for wood yield. Based on the biometric assessment of the tree traits in four locations of different agro-climatic regions, the girth of the tree at breast height has been establised as a reliable index for the selection of genetically superior trees. A total of 267 trees distributed in these stands, meeting the traits required for breeding have been marked out to serve as foundation material. From the seeds collected and seedlings studied in the nurseries, the screening techniques for marking out potential seedlings was standardised. With the seedlings thus screened out, 17 progeny yield trials have been laid out at five centres viz., Mettupalayam of Coimbatore district, Pallipalayam of Periyar district, Wangal of Tiruchy district, Vriddhachalam of South Arcot district and Onangudi of the Pudukottai district. Biometric observations on the growth of the seedlings in the trials progressively, have revealed so for over 12 selections to be consistently better indicating superior genetic sources for the evolution of high yielding strains. Mutant progenies developed through irradiation both by physical and chemical mutagens have been established. Interspecific and intraspecific hybridisation initiated has resulted in the development of hybrids. Through controlled pollination for the isolation of homozygous lines, S 1 lines have been established for further inbreeding work. Seed and Provenance stande with a total of 5169 seedlings over an area of about 8.25 ha in Mettupalayam of Coimbatore and Onangudi of Pudukkottai districts have been established. Australian provenances of *E. tereticornis* and other species were added to the germplasm collection.

Coppice potentiality has been identified to be influenced by coppice vigour, praductivity and stool longevity. Coppice vigour in the early stages has been biometrically assessed at two centres. Biometrical studies made in the plantations of Rajendram of Tiruchy district (5 year old) and in Sengeerai of Pudukottai district (10 years old) revealed that maximum production can be realised under favourable conditions of soil and climatie as obtained in the river padugai region of Rajendram in about half to two thirds the period required under semi-arid conditions as obtained in Sengeerai range. Biometrical data recorded in the two year old coppice plantation of Sengeerai indicated wide variation in number of

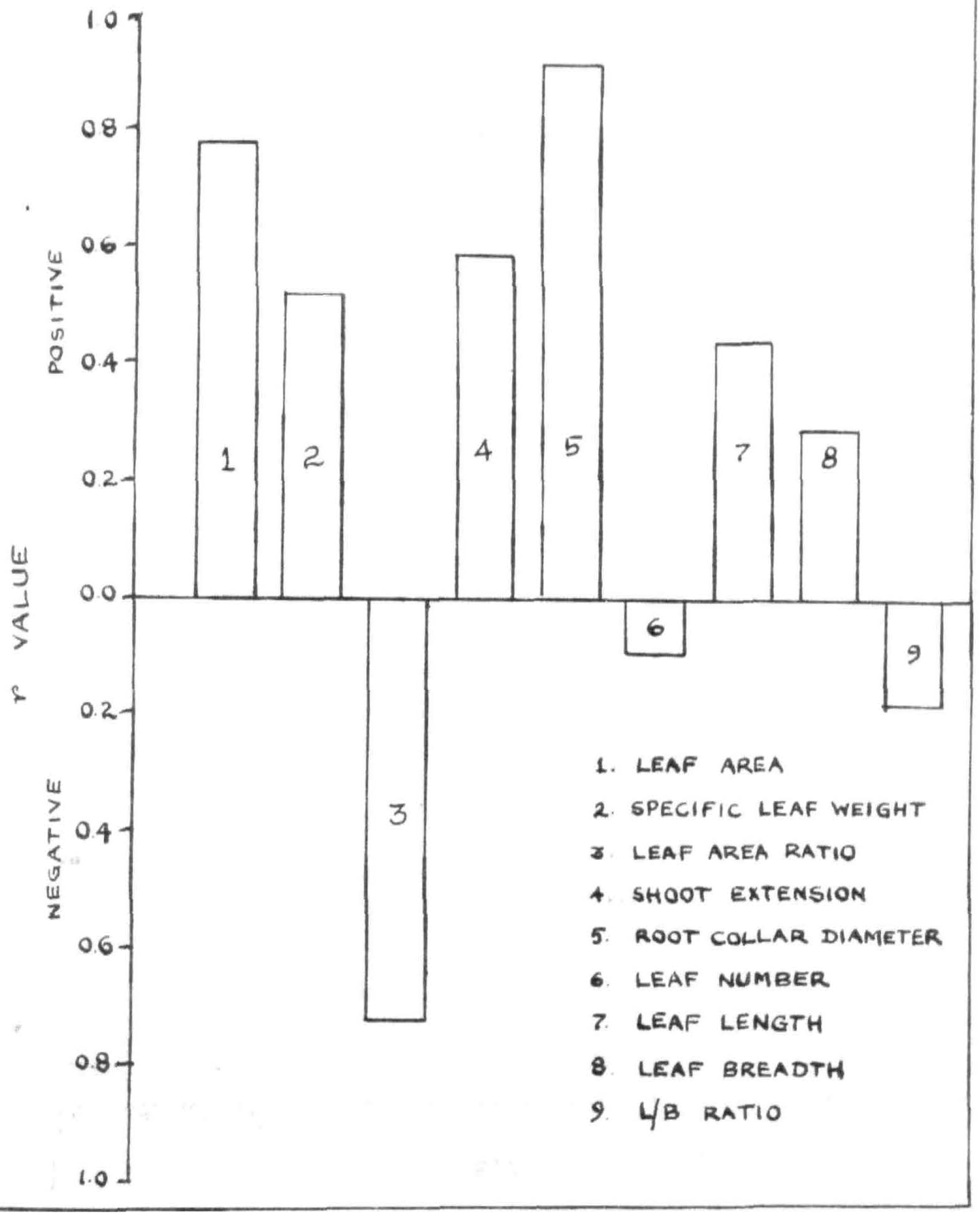
clusters with advancing age of coppice growth. More the diameter of the stool more was the coppice production. The intial growth and vigour of clusters showed competition among the clusters upto a period of about 4 to 6 months, followed by a similar competition within the clusters in the subsequent period of about 6-8 months. From the data recorded on the stool size and coppice growth it was observed that out of a large number of clusters developed in the minimum sized stools, the elimination by self-thinning was more (75.6%) than that observed in the maximum sized stools (40.0%) within a period of 16 months.

Work taken up in the vegetative propagation of the eucalyptus, single noded cuttings from seedlings have been found to offer scope. Trials on growth regulators have indicated a pre-treatment of IAA at 50 ppm to be useful in inducing rooting of cuttings. Observation on different media for beter rooting, has shown Shola soil to be a suitable medium. Seedlings of five months to 36 months growth have been found suitable for taking propagules for vegetative propagation. Attempts on cleft grafts have been encouraging and studies are in progress to standardise the method.

Preliminary field experiments with *Eucalyptus tereticornis* selections i. e. DF 12, DF 25, DF 27, DF 97, DF 100 and DF 148 were raised at Forsestry Research Station, Mettupalayam. The nitrogen levels (viz.) 0, 100, 200, 300, and 400 kg/ha were adopted for the trials. DF 97 and DF 100 are superior to other selections by recording higher plant height and base diamter. There was no significant response in the case of nitrogen application. The trials are again laid out with modifications.

Studies were carried out with six species of Eucalyptus viz, *tereticornis, alba, torelliana, exserta, citriodera* and *intertextra* at Forestry Research Station, Mettupalayam to determine the growth characteristic that subscribes most to seedling dry matter production. While LAR (leaf area ratio) exhibited a nagative correlation with DMP (dry matter production), leaf area, SLW (specific leaf weight), shoot extension, root collar diameter and leaf length contributed positively to dry matter content (Fig. 25). Of these five variables the correlation of root collar diameter with DMP was the strongest (0.92). This growth trial also had high heritability (85.7%) and moderate genetic advance (32.2%) and therefore it can be used as a reliable yard stick for measuring seedling quality. By advancing for planting only seedlings possessing a thick base consiberable increase in economic yield is possible.

FIG.25 CORRELATION OF DMP WITH OTHER MORPHO-PHYSIOLOGICAL ATTRIBUTES



Bamboo (*Bambusa arundinacea*)

Field experiments revealed that for producing vigorous seedlings of the 'hollow bamboo' (*Bambusa arundinacea)* in a short time (in about 10 months from 'pricking'in transplant beds), Urea to supply nitrogen at 300 kg/ha may be applied to the seedlings in the transplant beds, 4 months after transplanting, with the seedlings planted at 30 x 30 cm. The cost of the treatment works out to only 1.35 paise per seedling (@ Rs. 5/- unit price for N, in metric unit) and the chief benefits is drastic reduction in the duration spent by seedlings in the nursery.

Casuarina

Biomass of trees found at Coimbatore showed wide variability for yield. Green weight of needle and twigs ranged from 0.65 to 18.35 kg for 4 year old trees while the wet weight was 2.5 to 43 kg. The height of the tree ranged from 4.63 to 16.0 meters. The average weight of the tree was 16.545 kg. With a population of 4500 trees/ha at 1.5 x 1.5 m spacing, the yield could go up to 75 tonnes. The average quantity of nodules per cubic feet of soil near a tree ranged from 2.4 to 98.9 g.ms. But the distribution of nodules at three different pockets in Coimbatore campus ranged from 0, 30 and 40% of standing trees. But in coastal area the percentage ranged from 78 to 100% and nodulations occurred at 2.4 to 172.8 g per cubic feet. A high degree of positive correlation (0.6624) was found between the diameter of the tree and nodule weight. Tree height showed a low correlation.

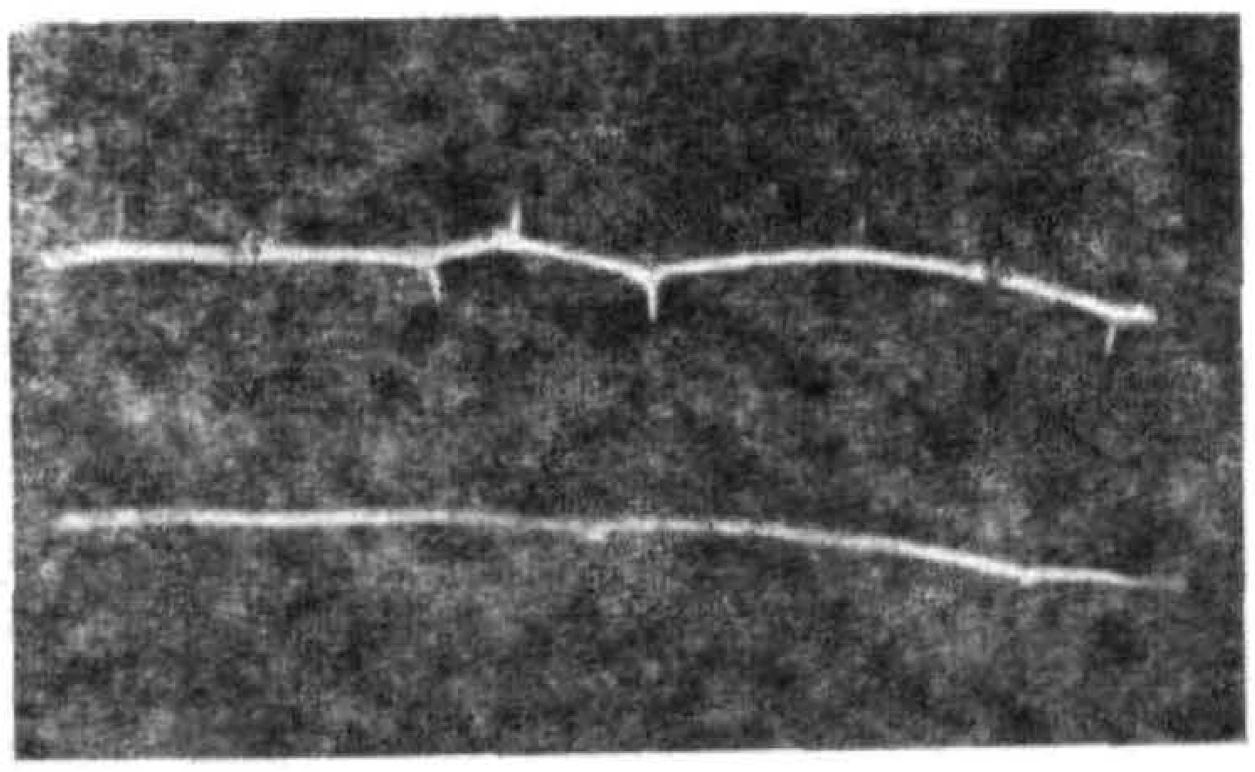
Enviornmental Studies

Ornamental and avenue trees like *Pongamia pinnata, Bauhinia racemosa, Millingtonia hortens, Pelttophorum pterocarpum, Azadirachta indica, Casuarina equisetifolia* and *Eucalyptus tereticornis* are some of the trees damaged by the fumes of sulphur-dioxide. The injury caused by it commences as speck in the region of the stomatal opening.

slowly spreading to coalesce the mosophyll cells. Further degeneration leads to collapse of the palisade layer. Acute injury causes the degeneration of upper and lower eipdermal layers resulting in the formation of holes in the lamina of the leaves. In most cases, the injury is centred in the inter-vein region. But in some cases, the intravein region is also affected. Decolouration commences with the loss of chlorophyll pigments both 'a' and 'b'. Spectrophotometric analysis indicated the loss to be in the magnitude of 40-95% for chlorophyll 'a' and 33 to 93% for chlorophyll 'b' in respect of *Pongamia pinnata, Bauhinia racemosa, Millingtonia hortens* and *Eucalyptus tereticornis*. Among the plants that showed recovery from wilting caused by sulphur dioxide, *Samanea saman, Delonix regia, Casuarina equisetifolia* and *Millingtonia hortens*. But *E. tereticornis* was the most affected by the fumigation.

Thornless Prosopis

A thornless spontaneous mutant form was spotted in the Tamil Nadu Agricultural University Campus by the School of Genetics. From a fence



population of about thousand plants, one plant was spotted wherein, out of five main branches, three were completely thornless. In the place of stout woody thorns, few tender thorn initials were observed and they were found to be flexible and deciduous. It was observed that they had

developed from a callus base instead of axillary bud. So the sudden appearence of thornless branch from a thorny individual may be due to somatic mutation occurred on the callus of the pruned end of the plant. Vegetative propagation was attempted by use of terminal and semi-hard wood cuttings. The rooted cuttings continued to maintain the thronless nature of the plant. All the seedlings established from the seeds of thornless branches also proved to be thornless confirming the recessive mutant nature of the thornless form. Isolation of such type will prove to be of immense value as a ''live-fence'' in house compounds and as a fuel tree without thorn.

❃ ❃ ❃

FISHERY SCIENCE

Monoculture of Tilapia in Sewage Ponds : Monoculture of tilapia in stabilished sewage ponds has yielded an annual production to the tune of 13,413 kg/ha without addition of any fertilizer and other expenditure on inputs like feed and power (Plate 55). Murrel-cum-tilapia culture yielded an estimated annual production of 2400 kg of murrel.

Induced breeding of exotic fish silver carp *Hypophthalmichthys molitrix* was successfully done for the second time by dry stripping method.

Fingerlings of Mrigal forcibly stunted for one year in aquarium showed growth four times more than that of the current year fingerlings when released in earthen pond along with the current year fingerlings at moderate management level. The daily growth increment of stunted and current year mrigal are 6.5 g and 1.63 g/day respectively. It is also noted that the stunted mrigal attained maturity in one year in the culture system. (Plate 56).

The effluent of Seshasayee Paper and Boards Limited discharged in the river caused reduction of growth in common carp 9 to 13%. Vivisection and anatomical examinations showed profuse corrosion of gills, dilation of red blood corpuscle nuclei, reduction in egg hatching percentage (4.75% in 10% effluent against 26.25%) and also reduction in protein value of the muscles (49.002% against 80.818%).

Energy and Nitrogen balance in the Nutrition and growth of Indian major carps : Rohu fingerlings fed at different concentration of protein 15 - 48%) in their diet (isocalorific feed) at 29°C and 22°C showed a net growth efficiency of 19.31 and a feed conversion ratio of 1.67 in tests with 40% protein feeds which was estimated as the optimum requirement for the fish fingerlings.

Among the three feed levels tested with the newly formulated (isocalorific) balanced feed on 'rohu' 4% feed level showed good conversion ratio (1.76). The relative efficiency was 0.004 g/day for 2% feed level, 0 016 g/day for 4% and 0.019 q/day for *ad lib* feed levels. Correspondingly the food conversion ratios obtained for common carp and mrigal with 4% feed level were 1.85 and 2.14. The influence of oxygen on mrigal was marked as the food conversion ratio obtained with high level of oxygen concentration was better, the values being 3.67 and 2.14 for low (3.2 - 4.1 ppm) and high (6.2 - 7.5 ppm) oxygen respectively.

Rohu and mrigal fingerlings maintained in 35°C with 2%. 4%, 6% (body wt. feed)' and *ad lib* feed (35% protein; energy value 4.45 K. Cal/g feed) showed that the food conversion ratios (FCR) were poor (4.7. 2.9, 3.1 and 3.9 respectively in rohu and 5.2, 3.9, 5.4 and 6.4 respectively in mrigal) compared to the values obtained in room temperature (29 ± 1°C).

Composite Fish Culture : The experiment on Composite fish culture of six species of indian and exotic carps along with murrels, which has been included after the carps have grown to bigger size, yielded a net fish production of 5481.8 kg/ha/year, in which the murrel can well be used as a component in composite fish culture, where it eliminates the weed fishes and keeps the water clean.

In another experiment, along with six species of carps, the milk fish, *Chanos chanos* were included as an additional component This experiment yielded a net fish production of 4704 kg/ha/year, in which the milk-fish contributed only 6.3% of total production. The low production contribution is mainly due to low stocking ratio (9.8%), but the growth rate (386.8 g) of the species is found to be better than the other carps namely rohu and common carp, suggesting that this species can also be included in composite fish culture along with Indian and Exotic carps.

Fish and Prawn culture in water Recirculation systems : A water recirculating system, which can hold 350 litres of water incorporating a biological filter to remove excess ammonia, a sterilisation chamber with UV light to destroy pathogenic bacteria and a water level controller to regulate constant flow of water was designed and fabricated using all indigenous materials.

The water quality maintained in the system was of a good order because of the provision of the biological filter and the sterilaistion as evidenced by the cent per cent survival of fish and prawn, represented by *Cirrhinus mrigala* and *Macrobrachium malcolmsonii* respectively. Studies with different fish feeds indicated that fishes have different feed specificity based on the food components. The rate of feeding was also found to vary from species to species *(C. mrigala - 4%; L. fimbriatus - 7%)* depending on the food. The effect of different stocking densities tried on *Catla catla* and *Labeo rohita* revealed that growth rate increased with decreasing stocking density. It was also found in both the cases namely *Catla* and *Rohu* that the survival was 100 per cent, indicating the possibility of maintaing the fish population at the rate of 25 Nos. per 10 litres of water. The relative growth rate and food conversion rate of *Labeo rohita* was higher at high water flow rate (3300 ml/ min.). They decreased when the flow rates were low. Growth rate of *Cirrhinus mrigala* was proved to be better at a stocking density of 2 fishes / litre. This trend was the same in all the grades of water in the recirculation system - biologically filtered, and sterilised stagnant waters. Keeping the studies with reference to stocking density in mind, one can regulate the same for very high production of fish and also for holding fry / fingerlings for a short span of time.

In view of the above findings, the stocking rate of the fry / fingerlings could be maintained as high as 25 million / ha in water recirculation systems. This would largely help in solving the fish seed problem of our country through a very high survival rate.

* * *

Plate : 55 MONOCULTURE OF TILAPIA IN SEWAGE PONDS

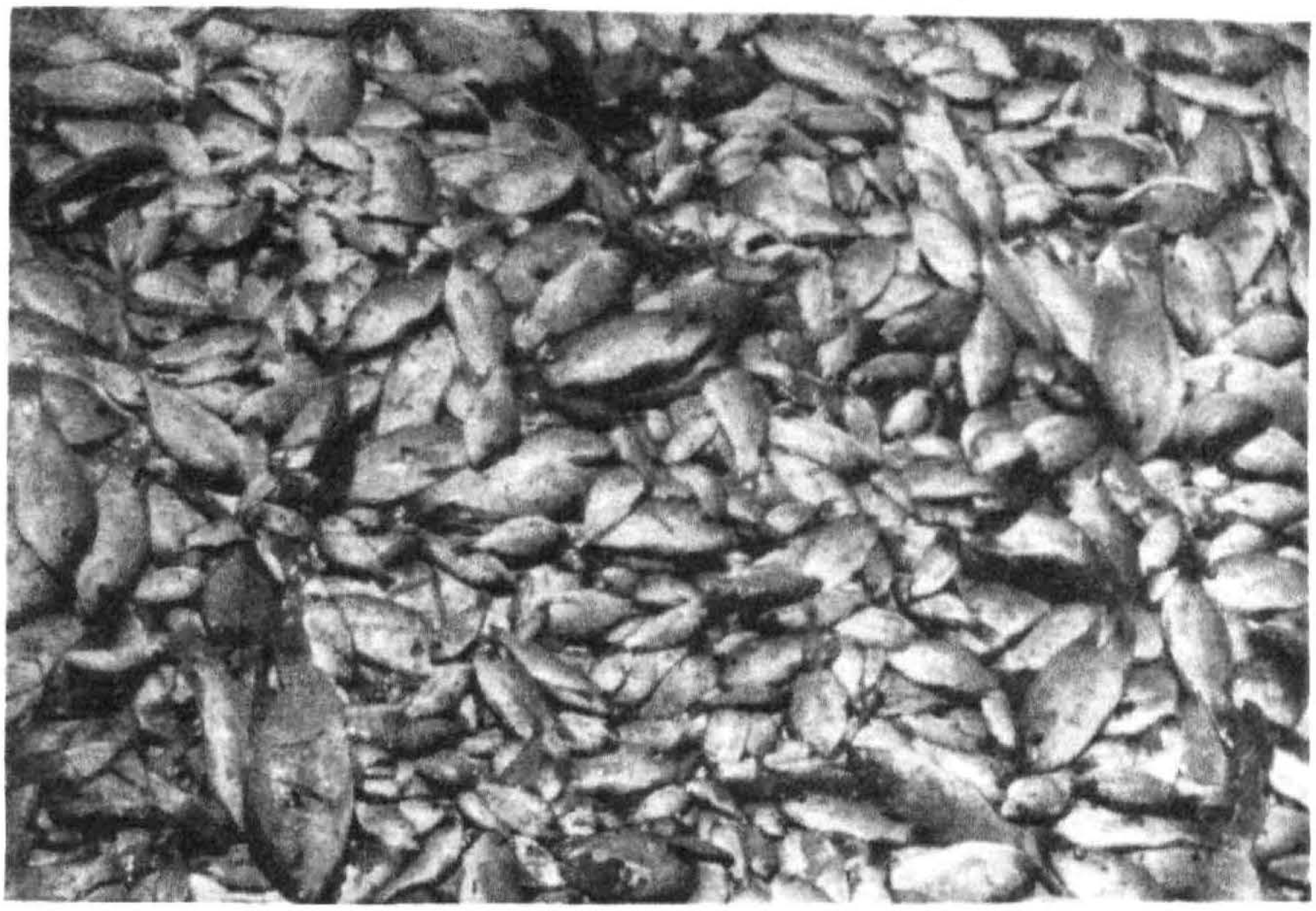
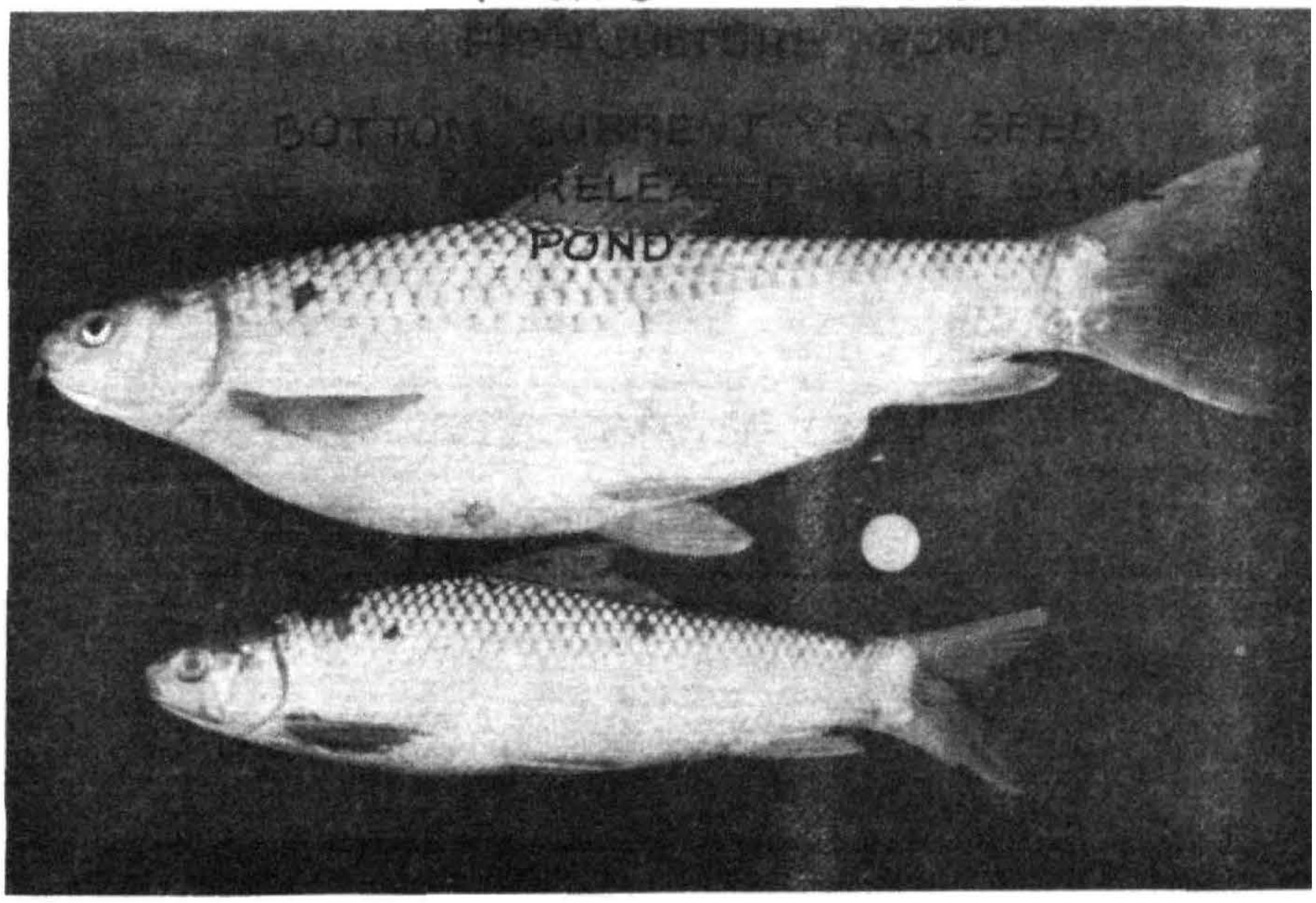


Plate.56 TOP : STUNTED MRIGAL SHOWING QUICK GROWTH IN COMPOSITE



Studies on the fortification of sago with vitamins and minerals : Pilot scale preparation of fortified sago was carried out in a sago factory at Salem. Sago was fortified with vitamins A and B_1 and minerals iron and calcium such that 50 gms of the prepared fortified sago supplied 1000 I. U. of vitamin A, 1 milligram of B_1 15 milligrams of iron and 0.4 gram of calcium. The storage studies revealed that the product required storage in a cool dry atmosphere. The nutritional evaluation of the product was carried out on children of 7 - 10 years of age. (Table164).

TABLE 164 Mean increase in the anthropometric measurements with Hb value and 't' value

	No. of subjects	Height (cms)	Weight (kg)	Chest circum ference (cms)	Arm circum-ference (cms)	Calf circum-ference (cms)	Heamo-(gm%)
Experimental Group	24	1.976	0.34	0.925	0.267	0.579	1.52
Control Group	24	1.708	0.34	0.970	0.101	0.487	0.41
't' value		1.266	0.3336	0.1618	1.078	0.698	3.3602

The children who were provided with fortified sago showed slight increase in the various anthropometric measurements over the control group. Haemoglobin level showed a remarkable increase in the experimental group. Further, the unhealthy conditions of the eyes, lips and skin were changed to healthy conditions in the experimental group when compared to the control group. Sago could be used as a medium for enriching the diet of children and invalids.

Mycotoxins in foods & feeds : A total No. of 2712 samples including various food grains, food products, fresh fruits and vegetables, oil seed cakes and animal feeds, were collected from different parts of Tamil Nadu and analysed. It was found that 112 Nos. of the collected samples (4.13% of the total number) were contaminated with any one of the mycotoxins under reference (Table 165).

Tomato soft drink : A formula for tomato soft drink with 10° brix, 0.5% acidity and 0.3% salt was standardised. The juice bottled with 100 ppm sodium benzoate as the preservative was found to have an acceptable shelf life of one month.

Ashgourd pickle : Ashgourd could be pickled in brine solution The concentration of brine used was 15% salt. After seasoning with oil and spices, the taste and flavour were found acceptable and the product remained in good condition for one month.

TABLE165. Prevalence of Mycotoxins in Foods and Feeds

Toxin	Sample Name	Total No. surveyed	No. of contaminated samples
Sterigmatocystin	Rice	360	6
	Wheat	528	14
	Cotton seed	30	2
Patulin	Scented supari	67	1
Penicillic acid	Apple	6	1
Aflotoxin	Cotton seed	30	2
	Groundnut oil cake	134	28
	Gingelly oil cake	83	4
	Coconut oil cake	96	3
	Feed concentrates	38	5
	Oil seed cake mixtures	10	4
	Poultry feed	60	19
	Groundnut candy	91	4
	Pickles	37	3
	Dried vegetables	43	4
	Dried Dates	18	1
	Scented supari	67	2
	Arecanut	54	1

Cucumber Pickle : Tasy pickles could be prepared from mature cucumbers. It was found that curing in 10% salt solution was adequate. Plain brine pickle could be prepared using peeled cucumber slices of 1" thickness (seeds removed) well submerged in the brine. For vinegar pickles, the slices were submerged in vinegar containing 10% salt. This pickle can also be seasoned with oil and different spices.

Storage of limes and vegetables : The studies on packing and storage of limes in polythene bags with vents and without vents and with out. packing under room temperature and under moist sand conditions were carried out. It was found that the limes could be stored under sterilised moist sand for a period of 15 days and limes kept under sterilised moist sand and with polythene packing remained good for more than 30 days and those stored with vented polythene bags under sterilised moist sand remained good for 15 days. There were only slight changes in the vitamin C, weight loss, sugar content and acidity of the juice. The same type of study was repeated with carrot, bhendi, raw tomato and oranges. It was noticed thar raw tomatoes and oranges packed in polybags and kept under moist sand remained good for 16 and 19 days respectively.

❖ ❖ ❖

MATHEMATICAL MODELS FOR BIOLOGICAL SCIENCES

The Mathematicians have developed a few models for microbial population, ideal plant selection, respiration and growth, energy and heat production in plants.

Model for Microbial Population : In microbial population exponential models are developed for the growth of bacteria, fungi, azotobacter and actinomycetes (in black and red soils) taking (i) pH, (ii) EC, (iii) OC, (iv) N, (v) K, (vi) C/N ratio, (vii) moisture as independent variables. Some of the models are valid irrespective of the depths from which the populations are drawn from the soils.

The model is of the form,

$$Y = a_0 \; X_1^{a_1} \; X_2^{a_2} \; X_3^{a_3} \; X_4^{a_4} \; X_5^{a_5} \; X_6^{a_6} \; X_7^{a_7}$$

Model for Ideal Plant Selection : In Plant Physiology, a model for ideal plant selection is developed. This will have potential use both in Physiology and also in Botany. The model takes into consideration all growth and yield characters. Let $X_1, X_2 \ldots X_n$ be the growth and yield characters on which it is necessary to fix levels for the ideal plant selection. Now collect data on $X_1, X_2 \ldots X_n$ and the yield Y, as much as possible so that it represents variations on all the $(n+1)$ characters fully. With the help of the scatter diagram, fit the model $Y = f(X_1, X_2 \ldots X_n)$. The actual estimation can be done by the OLS. Now the function is to be optimised by the use of calculus equating $\frac{\partial f}{\partial x_i} = o$ $i = 1, 2 \ldots n$—(I). The solution of this set of n equations will give a unique value for $X_1, X_2 \ldots X_n$. This value is to be used to test for the maximum on the Hessian H,

$$H = \begin{Bmatrix} f_{11} & f_{12} & \ldots & f_{1n} \\ f_{21} & f_{22} & \ldots & f_{2n} \\ f_{n1} & f_{n2} & \ldots & f_{nn} \end{Bmatrix} \text{ i.e. } |H_1| < O, |H_2| > O$$

If the condition on $|H_1|, |H_2|, |\ldots$ are satisfied, the solution of equation I will give values for $X_1, X_2 \ldots X_n$ which is the requirement for ideal plant.

Respiration Models : In the first model, change in the dry matter weight and the change in the growth respiration are needed to get constructive growth rate. From the second model, the method of calculating maintenance co-efficient is suggested.

Respiration Model I : IfR is the respiration rate, Sm, S_r respectively the maintenance respiration and growth respiration, then :

$$R = \frac{\Delta Sm}{\Delta t} + \frac{\Delta Sr}{\Delta t} \quad (1) \text{ and}$$

$$\frac{\Delta W}{\Delta t} = \left\{\frac{Y_G}{1 - Y_G}\right\} \frac{\Delta Sr}{\Delta t} \quad (2)$$

where $\frac{\Delta W}{\Delta t}$ = change in dry matter

$\frac{\Delta Sm}{\Delta t}$ = change in growth respiration

Y_G = constructive growth rate

A knowledge of change in dry matter and also the change in growth respiration will enable us to get the value of the constructive growth rate Y_G from equation (2)

Respiration Model - II

The respiration rate can be reduced to the form

$$R = \frac{(1 - Y_G)}{(Y_G)} \frac{\Delta W}{\Delta t} + \frac{\Delta sm}{\Delta t}$$

Here R is the respiration rate, Y_G the constructive growth rate $\Delta W / \Delta t$ change in dry matter weight and $\Delta sm/\Delta t$ change in maintenance respiration. A knowledge of R at different times and $\Delta W / \Delta t$ will enable us to calculate Y_G and $\Delta sm / \Delta t$.

If r is the specific respiration rate, then

$r = \mu \left\{\frac{(1 - Y_G)}{Y_G}\right\} + m.$ where μ is the specific growth rate, m' the maintenance co-efficient. A knowledge of r and μ at different points of time will give us Y_G and m.

Growth equations : These are given in two different forms, one in log linear and another in linear form in the inverse of the specific growth rate If 'A' is the initial plant dryweight, 'B' the maximum specific growth rate achieved by the plant in the early growth when there is no substate limitations, then the growth equation can be reduced to the form $W = Ae^{Bt}$ where 'W' is the dry matter weight at time 't'. B can be estimated by converting the above into semi - log form.

Another form of growth equation is :

$$\frac{1}{Y} = \frac{1}{Y_G} + \frac{m}{\mu}$$

where 'μ' is the specific growth rate, 'm' the maintenance co - efficient and 'Y_G' the constructive growth yield.

$$Y = \frac{dw}{ds} \text{ where S is the substate level.}$$

Specific growth rate is estimated as $\frac{d}{ds}(\log W)$

Energy and Heat Production in Plants :

During a small interval Δt of time. let

Δs be the change in substrate,

Δsm, the quantity of Δs used for maintenance,

Δsg, the quantity of Δs used for respiration,

Δw, the plant material g gained and

Δsr, the quantity of Δs which in completely respired, then

$\Delta sg = \Delta s - \Delta sm$ ---(1)

$\Delta sg = \Delta w + \Delta sr$ ----(2)

so that

$\Delta s = \Delta w + \Delta sr + \Delta sm$ ——(3)

Let us convert the above into energy equivalents.

If Es in the heat combustion of the substrate,

Ew, that of plant material and

Er, that of products of respiration, all in units of energy per Co_2 eqiuvalent

then (3) in the Enerng form is

$Es\ \Delta s = Ew\ \Delta w + Er\ (\Delta sr + \Delta sm) + \Delta Q$ —— (4)

Where ΔQ in the quantity of energy released as heat

If Er in assumed to be zero, then (4) takes the simple form

$Es\ \Delta s = Ew\ \Delta w + \Delta Q$ —— (5)

From (2) it is evident that smaller the respired term Δsr, the more efficiently substrate Δsg is converted into plant material Δw. If we denote by Y_G this convvnsion efficiency, then

$$Y_G = \frac{\Delta w}{\Delta w + \Delta sr} \quad \text{——— (6)}$$

also $0 \leq Y_G \leq 1$

$Y_G = 0$ if the entire Δs is repired

$Y_G = 1$ if the entire Δs is converted.

We can defire the ourall yields as

$$Y = \frac{\Delta w}{\Delta s} \quad \text{——— (7)}$$

$$= \frac{\Delta w}{\Delta w + \Delta sm + \Delta sr} \quad \text{——— (8)}$$

Using (6) and (8) we can define the energy conservation efficiencies for *growth $Y^1{}_G$ and for the overall process Y^1 as*

$$Y_G{}^1 = \frac{Ew\ \Delta w}{Es\ (\Delta w + \Delta sr)} = \frac{Ew}{Es}\ Y_G \quad \text{——— (9)}$$

and

$$Y^1 = \frac{Ew\ \Delta w}{Es\ (\Delta w + \Delta sr + \Delta sm)} = \frac{Ew}{Es} \quad \text{———(10)}$$

The equation analogous to

$$\frac{1}{Y} = \frac{1}{Y_G} + \frac{\Delta sm}{\Delta w} \quad \text{in energy is.}$$

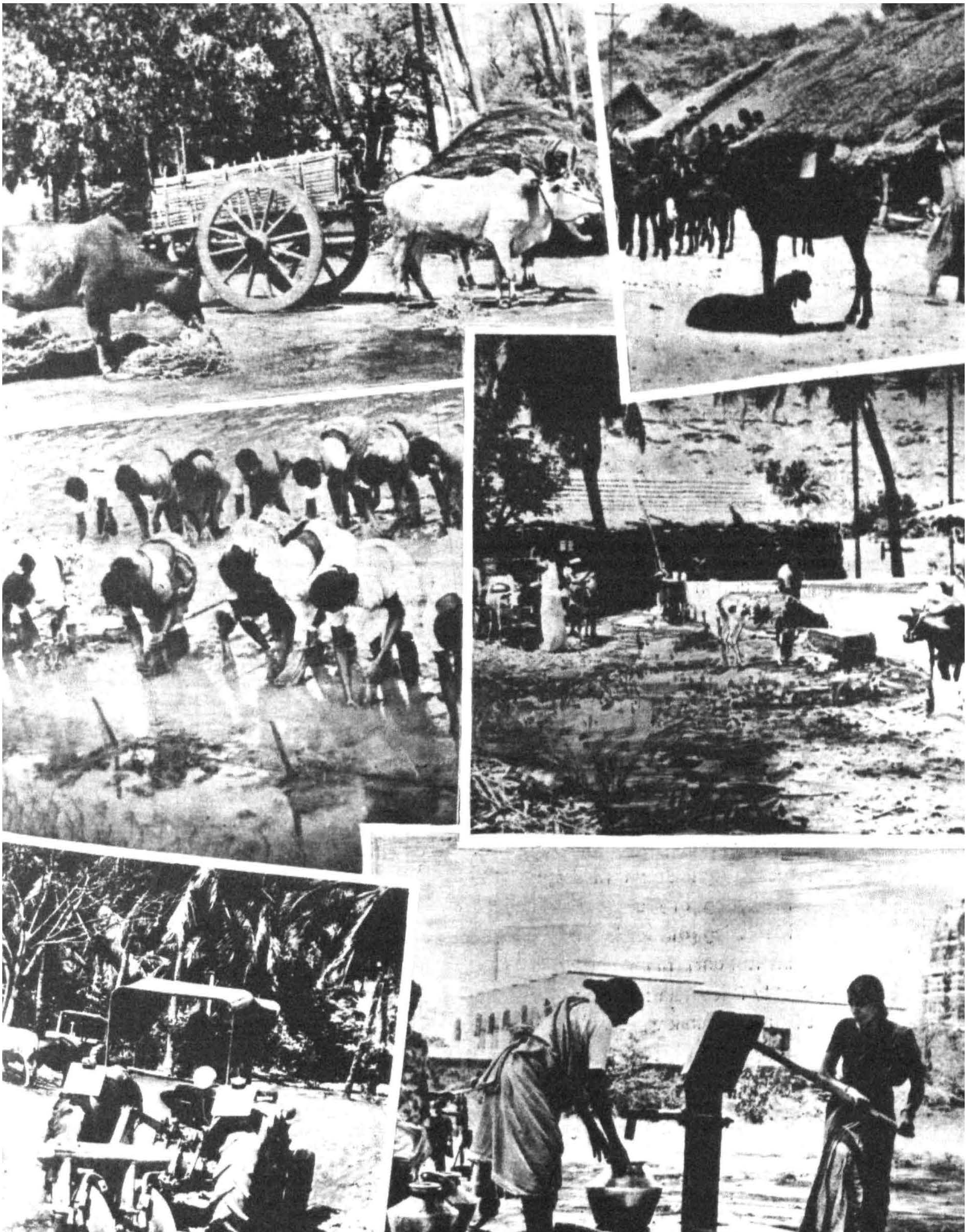
$$\frac{1}{Y^1} = \frac{1}{Y^1{}_G} + \frac{Es\ \Delta sm}{Ew\ \Delta w} \quad \text{———(11)}$$

using 5 and the fact that $\frac{\Delta s}{\Delta t} = \frac{\Delta w}{\Delta t} + R$, the rate of heat production can be simplified to

$$\frac{\Delta Q}{\Delta t} = Es\ R + (Es - Ew)\ \frac{\Delta w}{\Delta t} \quad \text{———(12)}$$

* Δ, and 4 are used interchangeably.

❋ ❋ ❋


RURAL DEVELOPMENT STUDIES

CONTENTS

Integrated Rural Development 231

Approach for Block Level Planning 232

Agricultural Policy 233

Production Economics 234

Water Resource Use in PAP 234

Decision Making under Risk 235

Production Constraints in Potato 235

Production Constraints in Brinjal 235

Labour use Pattern in the Nilgiris 236

Productivity of Farm Finance 236

Impact of Long Term Finance 236

Economics of Pisciculture 237

Broiler Production 237

Issues in Agricultural Marketing 237

Marketing of Turmeric 237

Marketing of Cattle 238

Institutional Marketing 238

Supply-Price Relationship of Rice 239

Diffusion of Innovation 240

Factors Influencing Adoption 240

Seeing is Believing 240

Effectiveness of Compact Block Demonstration 240

Transfer of Technology 241

Impact of Farm School in All India Radio 241

Training needs of Agri cultural Teachers 241

Farmer's Acceptance of Agri-cultural Extension personnel 241

Social Change 242

Effect of Land Ceiling Regu-lation on Farming System 242

Decision Makers

Decision Making Behaviour of the Farmers 243

Communication 244

Linguistic Treatment of Message 244

Studies relating to Agricultural Development 244

Tamil equivalents for Technical words 245

RURAL DEVELOPMENT STUDIES

Integrated Rural Development

Integrated rural development reflects a shift in emphasis in concept, aims and strategies of planning for economic development, and this shift aims at bridging the missing link in planning by bringing out plans close to reality. The integrated rural development implies comprehensiveness in planning, coordination in implementing the plans and enlisting participation of masses at large.

The aim of this approach is to bring basic facilities such as health, sanitation, care of disabled, education and other comforts of life to the villages In short, building necessary infra-structural facilities need to be considered as the beginning but not as the end of development efforts. Integrated rural development tries to exploit both the forward and backward intersectoral linkages to have larger and quicker impact. Involvement of the local people is an important aspect of the programme, since planning that has local sanction and support is considered the real beginning of integrated rural development

A decentralized three tier system of planning i.e., planning at national, state and local levels seems appropriate. In a system of decentralized planning a block may be an ideal unit for planning and plan adminstration, provided the block is compact and homogeneous. But both these conditions are however not met in India. Alternatively, the district may be the lowest tier of decentralized planning. Though it is likely to be more heterogeneous than any one block, cost of planning and plan administration may be comparatively low. One disadvantage with district level planning is that it may be difficult to enlist peoples, participation in the plan execution. To solve this problem, district level planning body may help each block within the district to draw up a perspective plan for 10 - 15 years. Consolidation of perspective plans of all blocks in the district plus the projects drawn at district level will form the perspective plan of the district.

The Panchayat Unions concerned may be entrusted with the responsibilities for mobilising the resources and implementing the plan with involvement of the people in the region. The agency responsible for actual execution would be the panchayat Union. As in the case of District Collector, who is the administrative head, but whose duty is well shared

by separate officials for administration and development, similar pattern may be followed at block level also.

The integrated rural development suggests consistency between ends and means as well as between ends themselves. It relates national goals to local efforts and in strategry, it calls for a combination of top-down and bottom - up approaches for a system of three tier decentralized planning and block level plan execution. In essence it means thinking globally and acting locally for national progress, through active participation of village communities.

Approach for Block Level Planning : The Block level planning has been recognized as an effective instrument for integrated rural development and it has an advantage of closely relating the local resources to the national goals and ensure local efforts. The study was taken up with the specific objective to prepare a model plan for integrated rural development of one selected block and to provide guidelines for the use of the plan elsewhere. Specifically, the model plan should identify consistent strategies for reduction in inequality in income distribution, elimination of poverty, reduction in unemployment and growth in per capita real income. This study covered Nallampalli Block in Dharmapuri district, Tamil Nadu, selected purposively for its economic backwardness. To analyse the problems of growth, structural transformation and intersectoral linkages and to allow for sector specific problems and constraints, a system of optimising models was designed. The system consisted of a multi-sector, multi-period model named BLOCK PLAN for the block as a whole. At a lower level, there were two sectoral models one called AGPLAN for agricultural sector and another called INDPLAN for the industrial (non-agricultural) sector.

Two major results were that risk constrained profit maximization was a realistic model for decision behaviour of farmers; and secondly it would be advantageous if paddy production could be discouraged to conserve water and to maximise returns. The results of INDPLAN revealed a five fold increase in employment in the industrial sector and it was the availability of supply not the cost of investible funds that constrained optimisation of activities in industrial sector. The BLOCK PLAN revealed that both agricultural and industrial sectors were observed to grow in absolute terms, but their relative shares changed substantially. The basic model was found to be internally consistent and several economic alternatives to the basic model were studied. After the choice being made

among the alternatives, operationalization of plan model was carried out for the Nallampalli Block and six service contres were identified and plan for their development was part of the operational plan. Block level planning attempted in this study is an example of what can be achieved with numerical models. Such efforts in model building are likely to prove highly useful for policy making for integrated rural development. The model provides a tool for analysing broad economic alternatives. It is a model plan, empirically tested and found useful for Nallampalli Block, but it may require suitable modification for use elsewhere.

Agricultural Policy

An analysis of growth pattern in Tamil Nadu agriculture during the past two decades brings to sharp focus some of the major constraints in development and suggests policy alternatives for bringing about overall agricultural development. Introduction of new technology has enabled Tamil Nadu to maintain its lead in aggregate farm production especially in rice. Increases in food production and that of commercial crops indicate that the farmers are aw are of and are responsive to the growth potentials in agriculture.

The goals for the eighties aim at achieving sectoral interdependance and developing agriculture as an integral part to enable the economy benefit out of the growth of agriculture. Agricultural development should be attempted through a causal mechanism of efficiency and equity determining output. During the past, the approach was to maximise production of all crops at State level. At macro level, it is suggested that the strategy for the future should consider comparative advantages of specialising in one crop at State level to fulfil the national goal of self sufficiency. At micro level, to achieve the objective of maximum aggregate farm profit, efficient farm planning is the appropriate tool. It is necessary to help the farmers in planning for optimal production, and efficiency in farm production must be the key word for the eighties.

Defective agrarian structure which has hitherto hindered agricultural development should be solved through more even distribution of assets to bring social justice and to reduce social tension and class war. Scale neutral new farm technology will further benefit the small asset holders, if necessary infrastructural facilities go with the agrarian reforms to provide supporting services. To lessen the problems of unemployment and under employment, technological progress in the eighties should be labour using to enable

agriculture to absorb more labour. Increase in labour productivity is possible with added investment in human capital.

The limited scope of adjusting supply to growing demand and changes in price resulted in cultivation of crops in marginal and sub-marginal lands, with the consequence of rising cost of cultivation, even in real terms. So, a policy support either in the form of price support or input subsidy is inevitable. It has been well documented that the benefits of price support have not reached the farmers because of inefficiency and imderfections in existing market functioning. On the contrary, input subsidy could be extended to help farmers who would be willing to use modern inputs to increase farm production.

Another constraint is the risk aversion of farmers. Therefore any future strategy to increase farm production must take into account the impact of risk on production decision of the farmers. Risk constrained decision behaviour of farmers can be aided by comprehensive farm planning.

In the present day agriculture, the objective should be growth through equity rather than growth for equity. The future progress lies in the improvement of managerial efficiency of farms rather than a quantitative development in resource use, and also in the reorganisation in the functioning of institutions.

Production Economics

Water Resource use in PAP : In the context of growing scarcity of irrigation water, a study was taken up to evaluate the performance of Parambikulam Aliyar project. The *ex post* evaluation identified a number of constraints in the efficient management of the project. It was designed to irrigate 80% of dry crop and 20% of wet crop. At present the wet crop area exceeded 50%. Also the estimated yield of reservoir's catchment was not realised in full. Planned discharge to the project area was 33 Tmcft, whereas in actual practice only about 18 Tmcft was realised, even in normal years. The planned duty was 85 acres/cusec but so far only 30-60 acres/cusec was realised. The planned command area irrigating in alternative years was initially 2.51 lakh acres and an addition of 1.15 lakh acres was included under extension of ayacut keeping the discharges at the same level. The organisational set up has both horizontal and vertical structures, which are inappropriate at present to achieve the objective of water distribution and management. The study suggested a

detailed review of the project *vis-a-vis* its objectives and initiate action programmes to improve its overall efficiency.

Decision Making Under Risk : A micro level study was conducted on "Decision making under risk" in Jayankondam Block of Tiruchirapalli. The adoption of high yielding varieties was found to be significantly influenced by the number of dependents in the family, risk aversion index and cash available for cultivation in irrigated farming while education became one more variable in case of dry land farms. The extent of risk aversion was significantly influenced by education, and value of farm assets in irrigated farms, while in dry farms, education, family dependents and value of the assets decided the risk aversion. Because of risk aversion behaviour of the farmers, both the irrigated and dry land farmers were found to be satisfied with lower levels of income, though they had chance of increasing their net income.

Inclusion of dairy enterprise and changes in crop-mix proposed by using MOTAD model was found to reduce the mean absolute deviation income in farms. The price stabilisation was found to reduce the income variation in paddy, groundnut and cumbu but not in varagu. The crop insurance premium rates calculated on the basis of annual loss was found to be higher and hence the farmers were reluctant to accept the present levels. If the premiums are subsidised in initial years of introduction, it would motivate the farmers to adopt crop insurance in subsequent years.

Production Constraints in Potato : A study on potato in the Nilgiris district showed that production of potato has increased by 48 per cent over a period of ten years with 60 per cent increase in productivity over the years. There still exists wide gap between potential yield and actual yield on farms. There is possibility of increasing the productivity by a margin of 1.50 tonnes per acre by adoption of modern technology. It was found that only 22 per cent of the sample farms raised high yielding varieties of potato. Non availability of quality seeds, inadequate and untimely supply were found to be the major constraints for productivity increase in potato. The study suggested setting up of adequate seed production centres to remedy this situation. The proposed centres could also demonstrate the modern technology to the farmers.

Production Constraints in Brinjal : The study conducted in Coimbatore district showed that high incidence of pests and diseases and associated high cost of plant protection were the major production constraints. Labour scarcity during harvest season, inadequacy and uncertainty

in the availability of electricity during summer months, excessive rain and the resultant water stagnation in winter months, lack of knowledge of improved varieties and reluctance to adopt improved package of practices and water management techniques were also reported as constraints in increasing production. The study revealed that the average yield of the sample farms was only 67 per cent of their expected yield and the optimal level of output was183.33 quintals with increasing returns to scale in the sample farms. In marketing vegetable crop, the price spread analysis revealed that the producer's share in consumer's rupee ranged from 37 per cent to 57 per cent.

Labour use pattern in the Nilgiris : A study conducted in the Nilgiris district of Tamil Nadu estimated that on an average, male labour could find employment for 223.50 mandays in a year. In the study area, no one was fully employed and 75 per cent of them were moderately under employed and the remaining 25 per cent were severely under employed. The male labour force was engaged for a minimum of 13.17 mandays in August and maximum of 22.14man days in April and May. Employment of female labour did not show significant variation among months. The total annual income of the household was Rs. 3076.02 of which 87.99 per cent was from agricultural wages and the rest from livestock accounting for 8.14 per cent of total income.

Productivity of Farm Finance : A study on farming showed that efficiency of credit, in general was high except in 13 per cent of the cases, where delayed receipt of loans resulted in low productivity. Net profit per rupee of credit used in farming worked to 35 paise. Timeliness, adequacy of credit, disbursement in kind, availability of irrigation, use of hybrid seed and fertilizers, determined the productivity of credit. The study revealed that the farmers prefer timely credit to cheap credit and they repay costly credit first. To tackle the overdues problems and encourge prompt repaymen, the study suggested that a rebate on interest rate may be introduced whenever loans are repaid in time.

Impact of Long Term Finance : A study conducted in 40 farms financed by four land development banks in Madurai district revealed that there has been perceptible changes in production pattern, income and employment as a result of long term finance. About 70 per cent of the advances made by the land development banks were towards minor irrigation. On an average, the cropping intensity in general had increased from 146.24 per cent to 161.42 per cent for the entire sample. The income as a result of investments showed an increase of Rs. 3,755 per farm and Rs. 1,076

per acre. In addition, there has been 63 per cent increase in man days employed in the farms. The study emphasized the need for increased short term credit facilities to exploit fully the benefits of long term investments.

Economics of Pisciculture : The study on economics of pisciculture in Thanjavur district showed that perennial tanks were more profitable with a profit of Rs. 0.67 per kg of catch than seasonal tanks which yielded only Rs. 0.55 per kg. Correlation coefficient of profit per kg with size of tanks was 0 2173 and it was not significant implying that small tanks are as efficient as large ones. Farmers expressed difficulty in supply of quality-fingerlings particularly the variety 'catla'. Pisciculture generated additional employment to the extent of 85 mandays per farm of one hectare in one year of which 43.5 mandays were required during harvest season of April - May, the lean season for crop production.

Broiler Production : The study on broiler production in the environs of Coimbatore city estimated that the cost of production of poultry meat (live weight) was Rs. 8 . 10 of which variable cost accounted for Rs. 7 91. High cost of feed and unavailability of quality seed stock are the major problems in production. The production is not profitable when prodution centre is beyond a distance of 5 Km from the city, on account of increasing transport and storage costs besides loss in quality due to improper handling.

Issues in Agricultural Marketing

Marketing of Onion : The study estimated that marketable surplus of small onion was about 97 per cent of the total production, of which 73 per cent of the sale was done at the village itself; 19 per cent was disposed through commission mandies; and 8 per cent at shandies. The marketing cost per quintal of onion to the farmer worked out to Rs. 1.21 at village, Rs.14.13 at Dindugal and Rs.11.18 at shandies. Low cost of marketing at villages was found to be an important factor influencing the bulk sale in the villages. The analysis on wholesale price in onion showed existence of a wide price fluctuation in the price. The price spread in onion revealed that the farmers' share was about 52 per cent in consumer's rupee. Imperfect market structure, lack of market information, high marketing cost and secret bidding were some of the major deficiencies of the Dindugal market.

Marketing of Turmeric : The study indicated that 76.92, 9.62 and 13.46 per cent of the farmers preferred sales through commission

agents, regulated market and cooperative marketing societies respectively. Commission agents were preferred because of timely loan and availability of gunnies. The marketing cost was Rs. 30.19, Rs. 22.16 and Rs. 5.27 respectively for above institutions. The price spread for turmeric realised by the producer was 69 18 per cent of the consumer's rupee and the market margin of the wholesaler, wholesaler cum processor and retailer were 4.74, 5.98and30.06 per cent of consumer's rupee respectively. The study also indicated that a quantity of 14901.15 quintals of turmeric was transferred to northern states for sale which was subjected to State Sale tax under the cover of transfer to head office or branch office. The export at national level increased every year by 471.90 tonnes while that from Tamil Nadu is decreasing by 150.46 tonnes year by year implying a fall in relative share of Tamil Nadu.

Marketing of Cattle : A study on marketing of cattle in Coimbatore district was taken up with the objective of knowing the structure and performance of cattle marketing. For this purpose, four important cattle markets in Coimbatore district viz. Pollachi, Punjai Puliampatti, Tiruppur and Thudiyalur were selected.

Of the total market arrival, white cattle accounted more than the black cattle, the local indegenous breeds accounted more than the exotic upgraded animal. The characters like breed type, expected milk yield, number of calving, age, length of legs and tail, number and location of 'Suli' and docility of the animal affect the price of the cattle.

It was also found that the immediate need of cash is the main reason for sale of cattle by the farmer and the scarcity of feed, sterility of cattle, high maintenance cost, undesirable characters and surplus number of cattle are other reasons for selling the cattle.

Three market channels were identified in cattle marketing (i) farmers-farmers, (ii) farmers-whole salers - cum - retailers - farmers and (iii) farmers-wholesalers-retailers-farmers. In the first two channels, cattle were transacted mainly for growing purposes and in third channel cattle were moved for slaughtering. In general, all the cattle were transacted mainly through the brokers.

Institutional Marketing : Specific objectives of the study were to evaluate the performance of regulated markets in Tamil Nadu, their impact on marketing cost of farmers and to identify problems in their working.

The study showed that farmers were aware of regulated market but there was wide gap between awareness and using the regulated markets. Participant farmers transacted through regulated markets realised higher prices for their products with much lesser marketing cost; thus increasing their profit margins. Demonstrations of the financial benefits accruing to the farmers and widespread propaganda and informative dissemination would enlarge the scope of the regulated markets benefiting a wider section of the producers and increasing the performance efficiency. Traders were also benefited by fair trade practices, low cost and bulk supplies available with regulated markets. They have, however a few real problems such as inadequate time for inspection of lots and inadequate financial facilities.

Provision of warehousing and banking facilities at all important market yards are recommended to help farmers in their expectation of higher price in future bidding.

Supply-Price Relationship of Rice in Tamil Nadu : A study was taken up to understand the structural and temporal behaviour of prices of rice and its competing crops, and to estimate the production response of rice farmers. The study region included five major rice growing districts of Tamil Nadu, viz., Chengalpattu, South Arcot, North Arcot, Tiruchirapalli and Thanjavur. The study revealed that the amplitude of fluctuations in farm harvest prices of rice and its competing crops namely ragi, irrigated groundnut and sugarcane were found to be higher than in the respective wholesale prices, and agricultural producers were highly prone to price risk. An analysis of seasonal behaviour of prices of rice showed that prices were lowest in the months between October and April in different districts of the study region. A peak in the price of rice was experienced during September uniformly in most of the districts.

The estimated functions of supply (production) response revealed that farmers respond to increased rice prices by increasing the area under rice and also yield of rice. The estimated supply elasticities were 1.75, 1.39, 1.40, 0.05 and 0.68 for Chengalpattu, South Arcot, North Arcot, Tiruchirapalli and Thanjavur districts respectively. These estimates clearly showed that famers positively respond to product price changes.

Diffusion of Innovation

Factors Influencing Adoption of Technologies in Cotton : The study revealed that all the big gardenland farmers were aware of the hybrid varieties of cotton. Among those farmers, only 24% were fully aware of all the practices like seed treatment, balanced manuring, plant protection etc. and the remaining respondents knew only partially. The small farmers cultivating cotton were also fully aware of the hybrid varieties and about 53% were partially aware of the recommended practices.

All the gardenland farmers adopted the high yielding varieties. About 29% of small farmers adopted high yielding varieties while the remaining, preferred the old strains in dry lands as mixed crop. Among the big farmers, 58.00% adopted MCU 5 and the remaining farmers adopted the other high yielding strains.

The seed treatment, even though was known to 90% of the gardenland farmers, only 8% adopted the acid delinting of seeds. With regard to small farmers, no one adopted the acid delinting. With regard to manuring, all the big farmers adopted the manuring but only 16% adopted the correct dosages recommended by the ICDP. In respect of dry cotton cultivation, they were not clear about the fertilizer applications. All the gardenland farmers adopted the plant protection measures. About 30% of them adopted less than 10 rounds of spray. No plant protection was given to dry cotton.

Seeing is Believing

Effectiveness of Compact Block Demonstration as a Technique to Transmit Know-how and Do how to the Farmers: The awareness about the conduct of compact block demonstration was found reducing among farmers as the distance increased from the demonstration area. Most of the nearby farmers and distant farmers had perceived the CBD as a method to demonstrate how to increase food production.

CBD influenced most of farmer demonstrators, nearby farmers as well as distant farmers to adopt correct seed rate and seed treatment. CBD was having little influence over farmers to adopt practices such as plant protection, fertiliser management and land shaping. The farmer demonstrators may be given training so as to infuse leadership and they can act as "Man to check with" in the area.

Because many farmers utilised neighbours and relatives for knowing and adopting farm practices, they may be given adequate farm information and made as "contact farmers".

Transfer of Technology

Impact of Farm School in All India Radio : The effectiveness of institutionalised Farm School on All India Radio on "Pulses cultivation" course offered by Tamil Nadu Agricultural University was studied.

It was found that as against the initial knowledge score range of 0 to 18 with mean of 9.97, the post-broadcast knowledge score range was 8 to 24 with mean score of 16.03 and thus mean gain was 6.06 score. Majority of respondents in the pre-broadcast evaluation had either medium level of knowledge or low level of knowledge only, whereas post-broadcast assesment reveals that about three fourth of them had either high level of knowledge or medium level and about one-sixth gained very high degree of knowledge on Pulses cultivation broadcast.

About half the listener-respondents who did not possess sufficient knowledge prior to exposure, gained fairly adequate knowledge during the exposure to farm school lessons. This mass media approach gains increasingly more credibility from farmers of all categories.

Training needs of Agricultural Teachers of Higher Secondary Schools : The study revealed that 36 per cent of Agricultural teachers are possessing poor knowledge, 34% moderate knowledge and 30% high knowledge in the vocational course content of Agriculture.

The Agricultural teachers have expressed their maximum training need in plant protection, post-harvest technology, soil conservation and cropping pattern. Based upon the calculated training need quotient, it is inferred that 22% of the teachers are having low training need, 34% medium training need, and 44% of them are having high training need. Demonstration, lecture method, study tours and panel discussion methods have scored high among agricultural teachers. Ninety six per cent of them preferred 'Agricultural Colleges' as desirable place to have inservice training.

Farmer's Acceptance of Agricultural Extension Personnel as their Leaders : Establishing good report and developing personal contacts with the farming community enable the extension personal to be accepted

makers belonged to high income group, three-fourth (88.89%) of them took decisions during the operations.

More than three - fourth (78.40 per cent) of the respondents belonged to Gounder caste. Among them, who were self decision makers-majority (71.26 per cent) did so during the operations whereas three-fourth (72.73%) of collective decision makers of Gounders did so earlier to the operations.

It has been found that nearby four - fifth (90.10%) and three - fifth (60.00%) of self decision makers and collective decision makers respectively, had the experience of 16 years and above.

Among those 72.41 per cent of well experienced self decision makers took decisions during the operations, whereas 66.67 per cent of well experienced collective decision makers took decisions earlier to the operations.

Communication

Linguistic Treatment of Message for Communication : The Chief findings of the study are : There is a need to match the stage of communication (awareness and information, instruction for adoption etc.,) with a 'mode'. Lacking in strcuturing the message units, many of the leaflets and bulletins fail to help the 'readers' with 'suitable' 'decoding' cues (Psycholinguistic problems) and hence not easily understood. Words and structures used in both mass-media forms of communication and classroom communication do not match with the existing frames of reference (socio-linguistic problems) of the target audiance and hence messages are not properly perceived. When there is an acute competition among messages, the choice of mode made by the extension communicators very often proves wrong. It fails to attract the attention of the target communicatees and to help them with either 'understanding' or 'retention' of the message.

Studies relating to Agricultural Development in Tamil Nadu

Publications : The following books are published in Tamil for the benefit of extension agencies, farmers and scientists. 1) A study of Agricultural Proverbs, 2) Thamizhilakkiyatil Velanmai Ariviyal, 3) Palamozhikalil Velanmai Ariviyal. In addition, two books, one on 'Understanding Scientific English' and the other on "English for Technical Studies" were published in English.

The following works in Tamil which have been completed are awaiting publication. 1) Agriculture during Thiruvalluvar's Age, 2) Water Management in Sangam period, 3)Nattupura padalkalil Velanmai, 4)Sanga ilakkiyatil Velanmai (Agricultural practices in Pallu Literatures and 5) Spoken Dialects of Farming Community (Trichy District).

Tamil Equivalents for Technical words : Nearly 800 technical words have been picked out and their Tamil equialants prepared and these will be useful to the scientists as well as to extension personnels for popular communication with the farming clientale.

APPENDIX - II

IMPORTANT VISITORS TO THE TAMIL NADU AGRICULTURAL UNIVERSITY

COIMBATORE CAMPUS

1. Hon'ble Prabhudas Patwari, Governor of Tamil Nadu and Chancellor of TNAU.
2. Dr. R. A. Malalasekera, A. Baur & Co., Ltd., Colombo, Sri Lanka.
3. Shri. M. M. Salla, Lok Bharatha - SANOSARA' Bhavanagar, Gujarat.
4. Tmt. Padmasubramaniam, Chairman, Community Welfare Committeee Women's Voluntary Service of Tamil Nadu.
5. Dr. S. T. Khade, P. K. V., Akola, Maharastra.
6. Prof. S. K. Mundiwale, Senior Research Scientist, PKV., Akola, Maharastra
7. Shri. C. S. Sangit Rao, Sorghum Pathologist, PKV., Akola, Maharastra.
8. Shri N. Krisnna Mohan, Department of Botany, Osmania University, Hyderabad.
9. Shri Akeya, High Court Judge, Orissa.
10. Shri P. Cattavarayan, M. L. A., Pondicherry.
11. Members of the Public Accounts Committee and Estimates Committee, Pondicherry Legislative Assembly.
12. N. S. Prabu, English Studies Officer, British Council, Madras.
13. Dr. A. S. Murthy, Senior Training Officer, ICRISAT, Hyderabad.
14. Trainees from 16 countries, ICRISAT, Hyderabad.
15. Shri Ramachandran, Extension Committee, Director of Extension, Univer, sity of Agricultural Sciences, Bangalore,
16. Trainees from 18 countries, ICRISAT, Hyderabad.
17. Shri T. K. Srinivasan, Vice-Chairman, State Planning Commission, Tamil Nadu
18. Prof. Y. Kiyokawa, University of Hitotisubbash, Japan.
19. Dr. William Easter, Professor, Department of Agricultural and Applied Economics, University of Minnesota, USA.
20. Dr. Russel Yost, University of Hawai, USA.
21. Dr. Yoshinari Kanehiro, University of Hawai, USA.
22. Thiru K. Kuppuswamy, M. L. A., Member, Board of Management, TNAU.

23. Thiru Govardhana Reddy, M. L. A., Chairman, Forest Devel opment Corporation, Andhra Pradesh.

24. Shri J. Stanley, Secretary, Tamil Nadu Agricultural Centre, Karamadai, Coimbatore District.

25. Shri P. V. Jayakrishna, Chief Secretary, Pondicherry.

26. Mr. Alberto B. Merald, Fertilizers and Pesticides Authority, Philippines.

27. Mr. A. J. Hauli, Ministry of Agriculture, Tanzania.

28. Mr. M. Balaghat Ultrah, Joint Director IRDP, Bangladesh.

29. Mr. K. P. Dhakal, Agricultural Input Corporation, Nepal.

30. Shri K. L. Suri, Fertilizer Association of India, New Delhi.

31. Mr. S. Rajadurai, Minister of Tamil Culture, Sri Lanka.

32. Shri R. S. Narang, Agricultural University, Ludiyana.

33. Mr. M. S. Grubben, Royal Tropical Institute, Amsterdam.

34. Mr. R. M. Shettom, Uyole Agricultural Centre, Tanzania.

35. Mrs. Regncer, French Centre of Scientific Research, Paris.

36. Shri R. Krishna Rao, Deputy Director of Agriculture (Cotton), Guntur.

37. Shri M. Basioh Ali Baig, Deputy Director of Agriculture, ICDP, Andhra Pradesh.

38. Shri T. L. Narasima Rao, Deputy Director of Agriculture, ICDP, Mandya' Karnataka.

39. Shri G. Boriah, Training Officer, UPASI, Coonoor, Tamil Nadu.

40. Shri Mr. Ravina Srinivasan, Programme Analyst, UNICEF, New Delhi.

41. Shri Rajesh Kishore, IAS (P) Lal Bahadur Shastri National Academy of Administration, Mussoorie, Uttar Pradesh.

42. Shri A. Mukhopadhyay, IAS (P) Lal Bahedur Shastri National Academy of Administration, Mussoorie, Uttar Pradesh.

43. Quintero K. Edwardo. Faculty of Agronomy, University of Zulia, Venezuela.

44. Mr. Alberto Parra, Faculty of Agronomy, University of Zulia, Venezuela.

45. Mr. F. H. Shah, Chief Section Officer, PCSIR, Pakistan.

46. Mr. G. W. Wimalaratna, District Agricultural Officer, Sri Lanka.

47. Mr. M. A. Kulathunga, Bee Development Officer, Sri Lanka.

SCHOOL OF GENETICS, COIMBATORE

1. Dr. S. K. D. C. Datta, Head, Department of Agronomy, IRRI.

2. Hon'ble K. A. Krishnasamy, Minister for Rural Development, Government of Tamil Nadu.

3. Dr. M. S. Swaminathan, Planning Commission, New Delhi.

4. Dr. Gurudev S. Khush, Plant Breeder, IRRI.

5. Hon'ble K. Kalimuthu, Minister for Agriculture, Government of Tamil Nadu.

6. Thiru Durai Govindarajan, Chirman, Tamil Nadu Tourist Development Corporation, Madras.
7. Thiru T. K. Sreenivasan, Deputy Chairman, Tamil Nadu Planning Commission.
8. Dr. S. B. Chavan, Millet Breeder, ICRISAT.
9. Mr. A. S. Murthy, Senior Training Officer, ICRISAT.
10. Dr. L. R. House, Sorghum Breeder, ICRISAT.
11. Dr. V. Ravindranath, Plant Pathologist, IARI Regional Station, Hyderabad.
12. Dr. V. V. Thobbi, Entomologist, IARI Regional Centre, Hyderabad.
13. Dr. D. S. Murthy, Sorghum Breeder, ICRISAT.
14. Thiru S. A. Subramani, I. A. S., Director of Agriculture, Madras.
15. Hon'ble S. Rajadurai, Minister for Regional Development, Tamil and Hindu Culture, Government of Sri Lanka.
16. Hon'ble R. V. Swaminathan, Union Minister of State for Agriculture.
17. Dr. Hugh Doggett, IDRC, Sri Lanka.
18. Dr. G. Donald Faris, Principal Pigeonpea Breeder, ICRISAT.
19. Dr. P. S. Reddy, Project Coordinator (Groundnut), Akola.
20. Dr. K. C. Jain, Pigeonpea Breeder, ICRISAT.
21. Dr. J. B. Smithson, Principal Chickpea Breeder, ICRISAT.
22. Dr. R. S. Dubey, Germplasm Geneticist, Kanpur.
23. Dr. G. W. Sellick, Director, AVRDC, Taiwan.
24. Dr. S Shanmugasundaram, Legume Programme Leader, AVRDC, Taiwan.
25. Dr. Raymond, D. Brigham, Associate Professor (Soybean and Oilseeds), Texas A. & M. University, USA.
26. Dr. Ydast and Dr. Kanehiro, Department of Agronomy, University of Hawai.
27. Hon'ble P. G. Monnin, Minister for Agriculture and Veterinary, Meghalaya.
28. Dr. D. P. Shah, Professor and Head, Animal Nutrition Department, HAU.
29. Thiru R. Muniappan, College of Agricultural and Life Sciences, University of Guam, USA.
30. Thiru S. R. Sosang Tzudir, Director of Agriculture, Nagaland.
31. Thiru Laxmi Narayanan, IAS, Managing Director, Industrial Development Corporation, Madras.
32. Dr. L. L. Ralwani, Programme Coordinator, Bharatiya Agro-Industries Foundation, Pune.
33. Dr. S. D. Rai, Project Coordinator (Forages), Jhansi.

PADDY BREEDING STATION, COIMBATORE

1. Dr. S. K. De Datta, Head, Department of Agronomy, IRRI.
2. Hon'ble K. A. Krishnasamy, Minister for Rural Industry, Government of Tamil Nadu.

3. Dr. M. S. Swaminathan, Planning Commission, New Delhi.
4. Dr. Gurudev S. Khush, Plant Breeder, IRRI.
5. Hon'ble K. Kalimuthu, Minister for Agriculture, Government of Tamil Nadu.
6. Thiru Durai Govindarajan, Chairman, Tamil Nadu Tourist Development Corporation.
7. Thiru T. K. Srinivasan, Deputy Chairman, Tamil Nadu Planning Commission.

DEPARTMENT OF NEMATOLOGY, COIMBATORE

1. B. H. Krishnamurthy Rao, Head of the Department of Entomology, APAU.
2. Dr P.K. Koshy, Nematologist, CPCRI.
3. Dr. Ramalingam, Head of the Department of Zoology, Madras University P. G. Centre, Coimbatore.
4. Dr. A. R. Seshadri, Dean, Post Graduate Studies, IARI.
5. Dr. Gopal Swarup, Nematologist, IARI.
6. Dr. C. L. Sethi, Head of the Division of the Nematology, IARI.
7. Dr. Y. S. Rao, Nematologist, CRRI.
8. Dr. D. S. Batti, Professor and Head, Department of Nematology, HAU.
9. Prof. S. Kannan, Head of the Department of Zoology, Thiagarajar College, Madurai.
10. Dr. M. V. Desai, Director, GAU.
11. Dr. H. M. Shah, Professor of Nematology, GAU.
12. Dr. D. R. Das Gupta, Professor of Nematology, IARI.
13. Dr. T. P. Sriharan, Senior Scientist, ICAR.

DEPARTMENT OF PLANT PATHOLOGY, COIMBATORE

1. Dr. V. T. Johan, Senior Plant Pathologist, Hyderabad.
2. Dr. A. Anjaneyulu, Plant Pathologist, Cuttack.
3. Dr. A. P. K. Reddy, Plant Pathologist, Hederabad.
4. Dr. N. N. Prasad, Professor of Plant Pathology, Annamalainagar.
5. Dr. M. C. Nair, Professor apd Head, Department of Plant Pathology, Kerala Agricultural University.
6. Dr. H. C. Govindu, Retired Professor of Plant Pathology, Bangalore.

DEPARTMENT OF AGRICULTURAL MICROBIOLOGY, COIMBATORE

1. Dr. O. A. Bevestetski, Director, All Union Agricultural Microbiology Research Institute, U. S. S. R.
2. Dr. O. P. Bhatnagar, Scientist, ICAR.

3. Prof. L. S. Cobly, UNESCO.
4. Dr. W. Edelmann, Projekt Biogas Eth., Zentrum, Zurich, Switzerland.
5. Mr. A Ghosh, Scientist, Rahara Research Centre of Central Inland Fisheries Research Institute, West Bengal.
6. Dr. B. A. Huser, Swiss Federal Institute for Water Resources and Water Pollution Control, Dubendorf, Switzerland.
7. Dr. H. K. F. Kaufmann, F. A. O.
8. Dr. A. V. K. Knotyanovich, Head of the Technology Laboratory, All Union Agricultural Microbiology Research Insitute, U. S. S. R.
9. Dr. V. V. Modi, Professor and Head, Department of Microbiology, M. S. University, Baroda.
10. Dr. P. N. Nandi, Director, PD and AC Research Laboratory, Calcutta.
11. Dr. R. D. Nanjiah, Director, Insitute of Animal Health and Veterinary Biologicals, Bangalore.
12. Thiru D. Narayanaswamy, Biochemist, Central Inland Fisheries Research Insitute, Barrackpore, West Bengal.
13. Dr N. S. Subba Rao, Professor and Head, Division of Microbiology, iARI, New Delhi.

DEPARTMENT OF CROP PHYSIOLOGY, COIMBATORE

1. Prof. S. K. Sinha, Water Technology Centre, New Delhi.

DEPARTMENT OF FOOD TECHNOLOGY, COIMBATORE

1. Thiru David Ahimaz, Programme Officer, South Indian Regional Office of UNICEF, Madras.
2. Dr. V. Nagarajan, Assistant Director General (Nutrition), ICAR.
3. Dr. K. N. Chandrasekaran, Dean, Home Science College, Udaipur.
4. Dr. Farukh Hassan Shah, Chief Scientist, PCSIR, Pakistan.
5. Mrs. Ravina Srinivasan, Programme Analyst, UNICEF.

FACULTY OF HORTICULTURE, COIMBATORE

1. Dr. Subbash E. Domir, USDA.
2. Mr. Minghlani, USDA.
3. Dr. K. S. Chaulian, Member, ICAR Visiting Team.
4. Dr. D. J. Boland, CSIRO, Australia.
5. Hon'ble Faruk Marakkayar, Speaker, Pondicherry State Assembly.
6. Dr. B. G. Rao, Senior Pathologist, IIHR, Bangalore.

7. Dr. K. Balaraman, Pathologist, IIHR, Banagalore.
8. Thiru W. P. A. R. Rajaram. Member, Board of Management TNAU.
9. Hon'ble K. Kalimuthu, Minister for Agriculture, Government of Tamil Nadu.
10. Thiru S. Shanmugasundram, AVRDC, Taiwan.
11. Thiru C. Lakshminarayanan, Managing Director, Tamil Nadu Industrial Investment Corporation.
12. Dr. S. P. Verma, Project Coordinator (Tuber crops), Trivandrum.
13. Hon'ble K. A. Krishnaswamy, Minister for Rural Industries, Government of Tamil Nadu.
14. His Excellancy the Governor of Tamil Nadu.
15. Dr. S. N. Rao. Senior Scientist, Forestry Research Station, Andhra Pradesh.
16. Dr. M. S. Swaminathan, Member, Planning Commission.
17. Thiru E. C. P. Prabhakar, Transport Commissioner, Government of Tamil Nadu.
18. Dr. N. Mohan Ram, Head of the Department of Botany, Delhi University.
19. Dr. K. Kandiah, Professor of Botany, University of Jaffna, Sri Lanka.
20. Dr. D. J. Hutchinsen, Citrus Breeder, USDA.
21. Dr. G. H. Grubben, Senior Agronomist, Tropical Research Institute, Amsterdam.
22. Hon'ble P. G. Momin, Minister for Agriculture and Veterinary, Meghalaya.
23. Dr. M. C. Nambiar, Preject Coordintor (Spices and cashewnut), Kasargod.
24. Dr. A. Rajendra Gupta, Project Coordinator (Medicinal and aromatic plants), New Delhi
25. Dr. Davy, Breeder-cum-Pathologist, California, USA.
26. Bro. S. C. Lawrence, Rangoon, Burma.
27. Thiru Gomathinayagam, Member, Extension Education Council TNAU.
28. Thiru Marimuthu, M.L.A., Pattukottai.
29. Dr. H. Y. Nakasona, U.S.A.
30. Dr. Koarna Mihardja, Indonesia.
31. Hon'ble T. K. Srinivasan, Vice-Chairman, State Planning Commission.
32. Mrs. Srea Drnakdt, SIDA

DEPARTMENT OF AGRICUTURAL ECONOMICS. COIMBATORE

1. Dr. Kenneth C. Nobe, Chairman, Department of Economics, Collarado State University, U. S. A.
2. Dr. K. William Easter, Professor of Agricultural and Applied Economics, University of Minnesota, U. S. A.
3. Dr. Anthony Bottrall, ODI, London.
4. Robert O. Lentorn, Programme Officer, Ford Foundation.

5. Shri Joshi, Assistant Director and Shri Agarwal, Tecnical Assistant, DES.
6. Dr. David Seckler, Ford Foundation.
7. Professor Y. Kiuokawa, University of Hitotsubhashi. Japan.
8. Dr. Russel Yost and Dr. Yoshinari Kanchiro, University of Hawai.
9. Thiru T. K. Srinivasan, Vice-Chairman, State Planning Commission, Tamil Nadu.
10. Dr. Robert Chambers and Dr. Mathew Dagg, Ford Foundation.
11. Dr. P. B. R. Hazell, IFPRI.
12. Mr. Gustavo Boklin, Swedish University of Agricultural Sciences.
13. Miss. Mariette School and Miss. Alija Boer, Research Associates, Department of Rural Sociology, Agricultural University, Wageningen, The Netherlands.

DEPARTMENT OF SOIL AND WATER CONSERVATION, COIMBATORE

1. Thiru M. Balasubramaniam, Executive Manager, Madura Coats.
2. Thiru T. Srinivasan, Deputy Chairman, Planning Commission, Tamil Nadu

DEPARTMENT OF FARM MACHINERY, COIMBATORE

1. Dr. A. C. Dutta, I. I. T. Kharagpur.
2. Dr. C. P Singh, Coordinating Engineer, ICAR Energy Requirement Scheme, PAU.
3. Dr. M. S. Swaminathan, Member, Planning Commission.
4. Mr. S. Narayanaswamy, Senior Technical Officer, Inter - Church Service Agency, Madras.
5. Dr. V. Nagarajan, Assistant Director General (Nutrition), ICAR, New Delhi.
6. Dr. Vamadevan, Centre for Groundwater Research Studies, Kerala.

DEPARTMENT OF AGRICULTURAL STRUCTURES, COIMBATORE

1. Dr. V. Nagarajan, Assistant Director General (Nutrition), ICAR.
2. Dr. Appa rao, Director of Research, APAU, Hyderabad.
3. Dr. H. P. C. Shetty, Director of Instruction, Fishery Science College, Mangalore.
4. Dr. H. R. Mishra, Dean, Veterinary Science, Rajendra Agricultural University, Ranchi.
5. Dr. K. S. Chauhan, Professor and Head, Department of Horticulture, HAU, Hissar.

DEPARTMENT OF AGRICULTURAL PROCESSING, COIMBATORE

1. Thiru K. A. Krishnaswamy, Hon'ble Minister for Co-operation, Tamil Nadu.
2. Dr. A. C. Dutta, I. I. T. Kharagpur.
3. Thiru T. K. Srinivasan, Vice-Chairman, State Planning Commission, Tamil Nadu.
4. Prof. A. C. Pandya, Director, C. I. A. E., Bhopal.
5. Dr. G. Singh, C. I. A. E., Bhopal.

MADURAI CAMPUS

DEPARTMENT OF AGRONOMY, MADURAI

1. Dr. M. A. Singlachar, Rice Agronomist, Regional Research Station, Mandya, Karnataka.
2. Dr. K. Gopalakrishnan Pillai, Senior Agronomist, AICRIP, Hyderabad.
3. Dr. A. Gnanam, School of Biological Sciences, Madurai-Kamaraj University, Madurai.
4. Dr. S. Kandaiah, Department of Botany, University of Jaffna, Sri Lanka.
5. Dr. S. K. Balal, Professor of Biology, Tennessee Technological University, U. S. A.
6. Thiru Y. Ung Kyung Choi, South Asia Project Department, World Bank, New York.
7. Dr G. N. Kulkarni, Zonal Coordinator, ICAR Water Management Scheme, College of Agriculture, Dharwad, Karnataka.

DEPARTMENT OF SOIL SCIENCE & AGRICULTURAL CHEMISTRY, MADURAI

1. Dr. N. Patnaik, Assistant Director General (Soils & Agronomy), ICAR, New Delhi.
2. Dr T. D. Biswas, Professor and Head of the Division of Soil Science and Agricultural Chemistry, IARI, New Delhi.
3. Dr. M M. Koshy, Professor (Research Coordinator) Kerala Agricultural University, Vellayani,
4. Dr. Motramani, Chairman, Review Committee of Soil Health Care Scheme, ICAR, New Delhi.
5. Dr. B. Ramamoorthy, Professor Emeritus, IARI, New Delhi.
6. Dr. M Velayutham, Project Coordinator, Soil Test Crop Response Scheme, Hyderabad.
7. Dr, G. Dev, Professor of Soil Science, PAU, Ludhiana.

8. Dr S. S. Soundararajan, Soil Scientist, Ruakura Research Station, Hamilton, Newzealand.
9. Dr P. Rangaswamy, Soil Scientist, Irrigation Research Institute, Victoria, Australia.

DEPARTMENT OF AGRICULTURAL ENTOMOLOGY, MADURAI

1. Twenty six trainees from Central Plant Protection Training Institute, Hyderabad.
2. Dr. V. K Veeresh, Professor of Entomology, University of Agricultural Sciences, Bangalore
3. The World Bank Team led by Mr. Motridge
4. Dr. B. H. Krishnamurthy Rao, Principal Agricultural College, APAU, Rajendranagar.
5. Dr. C. C. Abraham, Professor of Entomology, College of Horticulture, Vellanikara, Kerala.
6. Mr Jean Massat, Institute of Researches Cotton Textiles Exotiques, Paris.
7. Mr. M. K. Narayanan, Branch Manager. NOCIL, Madras.

DEPARTMENT OF PLANT PATHOLOGY, MADURAI

1. Thiru K. Kuppusamy, M.L A., Member, Board of Management TNAU
2. Thiru T. K. Srinivasan, Vice-Chairman, State Planning Commission.
3. Dr. M. S. Swaminathan, Secretary, National Planning Commission, New Delhi.
4. Dr. A. P. K. Reddy, Plant Pathologist (AICRIP), APAU.
5. Dr. V.T. John, Senior Plant Pathologist, AICRIP, Hyderabad.
6. Mr. K.O. Marfo, Trainee Scientist, Accra.
7. Mr. Nimitr Voorasoot, Trainee Scientist, Bangkok.
8. Mr. Banyong Toomson, Trainee Scientist, Ottawa.
9. Mr. Parasit Jaisil, Trainee Scientist, Bangkok.
10. Mr. T. Sommartaya, Trainee Scientist, Bangkok.
11. Prof. K.S. Narute, Agricultural College, Pune.
12. Dr. K. R. Sadasivan Nair, Professor of Botany, University College, Trivandrum.
13. Prof. M Unnikrishnan Nair, Professor of Zoology, S.N. College, Quilon
14. Prof. Lambat, Agricultural College, Warura.
15. Prof. Sarojini Menon, St. Mary's College, Tuticorin.
16. Thiru P.V. Parthasarathy. Chairman, Agricultural Committee, Madurai Productivity Council.

DEPARTMENT OF HORTICULTURE, MADURAI

1. Mr. J. Rice, University of Georgia, USA.
2. Mr. B. A. Shenoi, CECRI, Karaikudi, Tamil Nadu.
3. Mr. Mohan, I.A.S., Managing Director, PRC, Madurai.
4. Dr. Nagarajan, Assistant Director General, ICAR, New Delhi.
5. Mr. Harmut Lehinen, Agronomist, Medicinal Plant Cultivation, West Germany.
6. Dr. V. Venkatappiah, Professor of Pharmacology, Madurai Medical College, Madurai.

DEPARTMENT OF AGRICULTURAL ECONOMICS, MADURAI

1. Dr. Kenneth C. Nobe, Professor, Department of Economics, Colarado State University USA
2. Dr. Nothdge, World Bank.
3. Dr. William Easter, Professor, Department of Agricultural and Applied Economics, University of Minnesotta, USA.
4. Messrs. Robert Linton, Robert Chambers, Mathew Dagg, and Norman Collins, Ford Foundation.
5. Messrs. A. Piccolto and G.C.M. Cramer, World Bank.

TUTICORIN CAMPUS

FISHERIES COLLEGE, TUTICORIN

1. Dr. C. H. Fernando, University of Waterloo, Canada.
2. Prof. H.P.C. Shetty, Director of Instruction, Fisheries College, Mangalore.
3. Dr. R. Natarajan, Centre of Advanced Studies in Marine Biology, Annamalai University, Parangipettai, Tamil Nadu.
4. Dr. Chakravarthy, Project Co-ordinator, All India Co-ordinated Research Project, Bhubaneswar.
5. Dr. Rebanal, H. R., F.A.O. Expert on Brackishwater Fish Culture.
6. Dr. M. Karim, Fisheries Adviser, Bay of Bengal Programme.
7. Thiru W.P.A.R. Rajaram, Member, Board of Management TNAU.

MADRAS CAMPUS

1. Dr. Roger, L. Winans and Dr Nell W. Stockton, Veterinary Surgeons, USA.
2. Mr. John Mathews, former Vice-Principal, Staffordshire College of Agriculture and Chairman of the Veterinary Committee of the Pig Health Control Association, U. K.

3. Dr. Dennis G. Howell, Animal Health Advisor, University of Guelph.

DEPARTMENT OF OBSTETRICS, MADRAS

1. Dr. M. N. Menon, Retired Commissioner of Animal Husbandry, Government of India.

DEPARTMENT OF SURGERY, MADRAS

1. Dr. M. N. Menon, Retired Commissioner of Animal Husbandry, Government of India.

DEPARTMENT OF EXTENSION, MADRAS

1. Mr Horen Jones, Managing Director, Shillong Cooperative Marketing Society Limited.
2. Dr. T. R. Mehta, Ex-Deputy Director General, ICAR.
3. Dr. S. N. Tripathi and officer trainees, Indian Grassland and Fodder Research Institute, Jhansi.

DEPARTMENT OF PARASITOLOGY, MADRAS

1. Dr. M. L. Dewan, Professor of Pathology, Veterinary College, Bangladesh.

DEPARTMENT OF PHYSIOLOGY, MADRAS

1. Dr T. R Mehta, Research Review Committee, NARP.

ANIMAL SCIENCE RESEARCH STATIONS

POULTRY RESEARCH STATION, MADRAS

1. Hon'ble R. V. Swaminathan, Minister of State for Agriculture, Government of India.
2. Dr. Goutham, Director General, ICAR, New Delhi.
3. Dr. Dennis G. Howell, Animal Health Advisor, University of Guelph, Canada.

SHEEP BREEDING RESEARCH STATION, SANDYNALLAH

1. Shri Govardhan Reddy, Member, Board of Management APAU.

MECHERI SHEEP RESEARCH STATION, POTTANERI

1. Thiru S. Semmalai, B.A.B.L., MLA, Tharamangalam.

LIVESTOCK RESEARCH STATION, KATTUPAKKAM

1. Mr Anthony Brightling, University of Melbourne, Australia.
2. Shri N. K. Bhatacharya, Shri V. Nagarajan and Shri Chauhan, ICAR Visiting Team.

RESEARCH STATIONS

AGRICULTURAL RESEASCH STATION, ALIYARNAGAR

1. Dr. D J. Nevil, Groundnut Programme, ICRISAT.
2. Dr. K. S. Mangath, Scientist, Genetics Division, IARI.
3. Thiru V. R. Thirumalaiswamy, Farmer Vettaikaranpudur.
4. Dr. P. S. Reddy, Project Coordinator (Groundnut), Maharashtra.
5. Shri V. Ravindranath, Senior Pathologist, Agricultural Research Station, Hyderabad
6. Shri B. N. Reddy, Agronomist, Directorate of Oilseeds Research (ICAR), Hyderabad.
7. Dr P. Subramanyam, Groundnut Pathologist, ICRISAT.
8. Dr. A. Mohammad, Groundnut Entomologist, ICRISAT.
9. Thiru K. N. Sathyaprasad, B. Sc. (Ag.) and Dr. A. Ganesan, B. V. Sc., Instructors, RETC, Krishnagiri.
10. Dr. T. R. Metha, Retired Deputy Director General, ICAR and Chairman, Research Review Committee, NARP.
11. Dr K. V Raman, Dean, P. G. Studies, APAU, Hyderabad.
12. Dr A. P. Saxena, Senior Scientist, NARP.
13. Deputy Director of Seed Certification, Department of Seed Certification, Government of Tamil Nadu.
14. Thiru K Srinivasan, Assistant Director of Agriculture, Groundnut Package, Pollachi
15. Shri R. M. L. Moolchand, Secretary, Nilgirls Animal Welfare Society, Ootacamund
16. Thiru T Venkatakrishnan, Gomangalam, Udumalpet.
17. Thiru K Ramachandra Naidu, Nallampalli, Pollachi.
18. Thiru R. Gurunathan, Professor of Organic Chemistry, Coimbatore Medical College
19. Dr. S. S. Sindagi, Project Coordinator (Sunflower and Safflower).
20. Dr. A. Anilkumar, Pathologist, USA.
21. Prof. Nigam, Agronomist, Jalgoan.
22. Thiru R Viswanathan, B. Sc. (Ag.), Agricultural Economist, Centre for Water Resources, College of Engineering, Madras.
23. Dr G. Muthukumar, Agronomist, Centre for Water Resources, College of Engineering, Madras.
24. Dr. Alabi Isac Adje, ICRISAT.

AGRICULTURAL RESEARCH STATION, BHAVANISAGAR

1. Dr V. N Iyer, Scientist, ICAR.
2. Dr. T. R. Mehta, Retired Deputy Director General, ICAR.
3. Shri S. S Sindagi, Project Coordinator (Sunflower).
4. Dr G. N. Kulkarni, Associate Project Coordinator (Water Management).
5. Dr. Dagg, Ford Foundation, New Delhi

UNIVERSITY RESEARCH CENTRE, ADUTHURAI

1. Dr. V. Agnikothrudu, Technical Manager, Research & Development, Rallis India, Bangalore.
2. Dr. B. S. Naidu, Rice Breeder, Karnataka.
3. Dr M. V. Shastry, Senior Rice Breeder, AICRIP, Hyderabad.
4. Thiru R. Baskara Rao, Rice Breeder, Andhra Pradesh.
5. Dr K Karunakaran, Rice Breeder, Kerala.
6. Thiru K Ramamoorthi. Sandoz (India) Ltd., Coimbatore.
7. Thiru V. Srinivasan, Product Development Manager, Monsanto, New Delhi
8. Thiru C. V. Venkataraman, Technical Excutive, Sandoz (India) Ltd., Trichi.
9. Thiru K Bhattacharaya, Manager, Technical Development (Agrochemical Division), Bombay.
10. Dr. S. Thiagarajan, Technical Officer, Agromore, Bangalore.
11. Thiru D. Krishnamurthy, Manager, Union Carbide, Madras
12. Thiru V. Kalamegam, Sales Representative, Roman Industries, Madras.
13. Thiru B. M. Rex, Senior Sales Representative, Darshak, Trichy.
14. Dr. Singh, Agronomist, AICRIP, Maharashtra.
15. Thiru Naidu, Manager, Karuppur Farm, Pandanallur.
16. Thiru V. Sundaresan, Landlord, Kanjanagaram.
17. Thiru R. Thirunavukarasu, Landlord, Nagapattinam
18. Thiru R. Manicka Mudaliar, Landlord, Manjakollai.
19. Dr. V. T. John, Senior Pathologist, AICRIP, Hyderabad.
20. Dr. Rajan, Pathalogist, Kerala Agricultural University.
21. Dr. Senne Gowda, Pathologist, Karnataka.
22. Dr. J. Ramakrishna Rao, Rice Breeder, AICRIP, Hyderabad.

UNIVERSITY RESEARCH CENTRE, KOVILPATTI

1. Dr. T. R. Mehta, NARP.
2. Dr. K. V. Raman, NARP.
3. Dr. A. P. Sexena, NARP.

4. Dr. Jeorge Friesen, Principal, Canadian Adviser, Dryland Agricultural Cell, Hyderabad.
5. Dr. V. Balasubramanian, Assistant Project Coordinator (Physiology), Dryland Agricultural Cell, Hyderabad.
6. Dr. S. N. Chatterji, Project Coordinator (Vegetable Crops), Division of Vegetable Crops and Floriculture, IARI.

COCONUT RESEARCH STATION, VEPPANKULAM

1. Thiru M. P. Thanikachalam, Secretary, Pondicherry Land Development Bank.
2. Thiru N. Rajaram, Muthambatti, Pondicherry.
3. Thiru S. Kandasamy, President, Co-operative Agro-Service Centre, Periakulam.
4. Thiru R. Ganesan, Kulkurichi, Perakurichi.
5. Thiru M. Subbian, Agricultural Officer, Srivenkatesa Paper Boards, Madathukulam.
6. Thiru M. Thangarajan, Professor of Chemistry, Government College, Kumbakonam.
7. Thiru O. V. R. Somasundaram, Odayakulam Post, Pollachi.
8. Thiru S. Bujankan, Agricultural Instructor, Government Boys Higher Secondary School, Puttukkottai.
9. Thiru V. Subramaniam, Kunniyur House, Mannargudi.
10. Thiru P. Ramachandran, Jakkarpalayam, Pollachi.
11. Thiru K. Satyabalan, Project Co-ordinator, CPCRI, Kasaragod.
12. Thiru K. R. Natarajan, Sri Rajaganapathy Farm, Pudukkotai.
13. Thiru V. C. Naidu, Manager, A. K. R. Farm, Karuppur, Kumbakonam.
14. Thiru M. Ramachandran, District Forest Officer, Kanyakumari.
15. Thiru M. G. Raju, Assistant Professor, Pachayappa's College, Madras.
16. Thiru M. Vadivelu, Agricultural Instructor, Government Higher Secondary School, Pattukkotai.
17. Thiru Dr. P. P. Davis, Pattukkottai.
18. Thiru Dr T. Murugappa Chettiar, Veerakurichi.
19. Thiru M. S. Rajendran, Pattukkottai.
20. Thiru V. Thakshinamoorthy, Karuppur.
21. Thiru N. Chinnu, Thathachariar Gardens, Srirangam.
22. Thiru R. Subbian, Thathachariar Gardens, Srirangam.
23. Thiru R. Chinnasamy, Thathachariar Gardens, Srirangam.
24. Thiru R. Rajendran, Kadanthakudi.
25. Thiru T. Sokkaligam, Vedaranyam.

26 Thiru R. Ingersal, Pattiveeranpatti.
27. Thiru A. Selvaraj, Pattukkottai.
28. Thiru R. V. Somasundaram, Veppankulam.
29. Thiru N. Natarajan, I.P.S , Superintendent of Police, Pudukkottai.
30. Thiru P. Samraj. Plant Scientist, Central Soil Conservation Centre, ICAR
31. Thiru K. N. John, Research Officer, Tamil Nadu Sugarcane Farm Corporation, Vadapathimangalam.
32. Thiru A. R Krishnamoorthy, Partner, A. K. R. Pannai, Karuppur, Mayuram.
33. Thiru Dr. M. Govindan, Agricultural Consultant, Thillai Nagar, Trichy.
34. Thiru Senthil, Kottaiyur, Chettinad.
35. Thiru A. R. Marimuthu, Ex. M. L. A., Alathur.
36. Thiru R. Durairaj, Agricultural Officer, Srirangam.
37. Thiru P. Shenbagarangam, Advocate, Tenkasi.
38. Thiru N. T. Viswanathan, Lalgudi, Trichy.
39. Thiru V. Srinivas, Agricultural Officer, Madurai.
40. Thiru S. Rajendran, Agricultural Officer, Manamadurai.

SUGARCANE RESEARCH STATION, CUDDALORE

1. Shri R. B. L. Srivastava, Senior Agricultural Engineer, Indian Institute of Sugarcane Research, Lucknow.
2. Dr. T. R. Mehta, Retired Deputy Director General, ICAR.
3. Dr. K. V. Raman, Dean, P. G. Studies, APAU.
4. Dr. A. P. Saxena, Senior Scientist, ICAR, New Delhi.
5. Dr. K. K. Srivastava, Senior Scientist, Indian Institute of Sugarcane Research, Lucknow.

CASTOR RESEARCH STATION, POTTANERI

1. Thiru S. Semmalai, B. A., B. L., M.L.A., Tharamangalam.

REGIONAL RESEARCH STATION, PAIYUR

1. Mrs. P. Manimozhi, Gazetted Lecturer, RETC, Krishnagiri.
2. Dr. C. T. Patel, Indian Cotton Mill Federation Project Co-ordinator.
3. Mrs. K. Banu, Gazetted Lecturer, RETC, Krishnagiri.

NATIONAL PULSES RESEARCH CENTRE, PUDUKKOTTAI

1. Dr. S. Sithanandam, Entomologist, ICRISAT.
2. Dr. J. B. Smithson, Breeder, ICRISAT.

3. Thiru S. Gopalan, Soil and Water Management Research Institute, Thanjavur.
4. Professer S. Ramanujam, Head, Division of Genetics and Project Coordinator (Pulses) IARI.

FORESTRY RESEARCH STATION, METTUPALAYAM

1. Dr. Subash C. Domir, Plant Physiologist, USA.
2. Dr. D. J. Boland. Division of Forest Research, CSIRO, Australia.
3. Dr. A. K. Sacheti, Reader. NCERT, New Delhi.
4. Dr. R. M. Burns, Principal Conifer Sylviculturist, USA.
5. Dr. T. R. Mehta, Retired Deputy Director General, ICAR.
6. Thiru B. Boomarajan, Conservator of Forests, Andhra Pradesh.
7. Thiru P. Govardhan Reddy, M.L.A., Andhra Pradesh.
8. Mrs. Svea Ornstedt, SIDA.

HORTICULTURAL RESEARCH STATION, PERIYAKULAM

1. Thiru A. M. Natarajan, Secretary, Tamil Nadu Cotton Growers Association, Udumalpet.
2. Dr. T. R. Mehta, Dr. Raman and Dr. Saxena, ICAR Research Review Committee.
3. Thiru W. P. A. R. Rajaram, Member, Board of Management TNAU.
4. Thiru A. R. Subbaiah Mudaliar, Ex-M. L. A., Tenkasi.
5. Dr. S. Kandiah, Department of Botany, University of Jaffna, Sri Lanka.
6. Dr. Rajkumar, I. A. S., Assistant Collector, Periyakulam.
7. Bro. Laurence, Rangoon, Burma.
8. Thiru W. P. A. R. Nagarajan, Planter, Pattiveeranpatti.
9. Thiru B. Murugan, Registrar, Madurai - Kamaraj University.
10. Thiru M. S. Pandian, Planter, Pattiveeranpatti.
11. Dr. Chavan, Member, ICAR Team.
12. Dr. D.G. Rao, Head of the Department of Plant Pathology, IIHR., Bangalore.
13. Thugili C. Subramaniam, Farm Radio Officer, All Indio Radio, Trichy.
14. Mrs. Chanora Jaganathan, Lakshmi Mills, Coimbatore.
15. S. Ramasamy Naidu, Ramu Foundry, Coimbatore.

HORTICULTURAL RESEARCH STATION, KODAIKANAL

1. Dr. K. S. Chauhan, Professor and Head, Horticultural Department, HAU.
2. Thiru R. Poornalingam I. A. S., Collector of Madurai.

3. Hon'bie V. M. C. Sivakumar, Minister for Agriculture, Pondicherry.
4. Thiru K. Kuppuswamy, M L. C , Member, Board of Management TNAU.
5. Dr. M. K. V. Bappu, Director I. I A., Bangalore.
6. Thiru S. V. Balasubramaniam. Staff Reporter The Hindu

HORTICULTURAL RESEARCH STATION, THADIYANKUDISAI

1. Dr. D.G. Rao. Professor and Head, Division of Plant Pathology, IIHR, Bangalore.
2. Dr. T. R. Mehta, Retired Deputy Director General, ICAR.
3. Dr. K. V. Raman, Dean, P. G. Studies, APAU.
4. Dr. P. Saxena, Senior Scientist (NARP), ICAR.
5. Thiru W. P. A. R. Rajaram. Member, Board of Management TNAU.
6. Rev. Fr. Peter Royappa. St. Mary's Estate, Perumbarai.
7. Thiru M. Alagarsamy, Planter, Kodalangadu.
8. Thiru P. R. M. Rajaram, Planter, Ovamalai Estate.
9. Thiru W. P. A. S. Dilipkumar, Planter, Ammikulavi Estate.
10. Thiru S. Vijayasarathi, Planter, Sirumalai.
11. Mr. Joe Homan, Administrator, Boy's Town Trust, Thirumangalam.
12. Thiru S. K. Soundarapandiyan, Planter, KanalKadu Estate.
13. Thiru K. T. M. R. Jeyachandran, Planter Agamalai Estate.
14. Thiru A R. K. Sundaram, Planter, Manalur Estate.
15. Thirf S. K. T. Shanmugham, Planter, Pannaikadu Estate.
16. Thiru S. S. P. Namasivayam, Planter, Adalur Estate.
17. Thiru M. S. P. P. Nithiyanandan, Planter, Chandralakshmi Estate, Managalacombu.
18. Thiru S. Mohanasundaram. Planter, Thandigudi Estate

KRISHI VIGYAN KENDRA, PONDICHERRY

1. His Excellency Shri. B T. Kulkarni, Lieutenant Governor, Pondicherry.
2. Sri Rao Birendra Singh, Hon'ble Union Minister for Agriculture.
3. Hon'ble D. Ramachandran, Chief Minister, Pondicherry.
4. Hon'ble V. M. C. Sivakumar. Minister for Agriculture, Pondicherry.
5. Thiru M. Shanmugam, M. P., Pondicherry.
6. Thiru V. P. Munuswamy, M. P., Pondicherry.
7. Dr. O. P. Goutham, Director General, ICAR.
8. Dr. C. Prasad, Assistant Director General (Education), ICAR.
9. Thiru Avinashilingam Chettiar, Coimbatore.

10. Dr. Rajammal P. Devadas, Avansilingam Home Science College for Women, Coimbatore.
11. Thiru P. V. Jai Krishnan, I. A. S,, Chief Secretary, Government of Pondicherry.
12. Thiru Pradeep Singh, I. A. S., Development Secretary, Pondicherry.
13. Dr. H. Bruchholz, Scientist, G D. R.
14. Thiru S. C. Sharma, Indian Potash, Madras.
15. Thiru K. Sivaramakrishnan, B.Sc.(Ag.), Director of Agriculture, Pondicherry.
16. Thiru S. S. Mahdi, Commissioner (Fertilizer Promotion), Union Ministry of Agriculture.
17. Selvi T. Padmasini Asuri, Regional Home Economist, Directorate of Extension, Bangalore.
18. Shri H. Rama Rao, Deputy Secretary, Silk Development Board, Ministry of Commerce and Trade, Bombay.
19. Thiru Venugopal, M. L. A., Acting Chairman, Estimates Committee, Pondicherry.
20. Thiru P. Kathavarayan, M. L. A., Member. Estimates Committee, Pondicherry.
21. Thiru G. Murugesan, Member, Estimates Committee, Pondicherry.
22. Thiru Subbaroya Gounder, M. L. A., Member, Estimates Commitee, Pondicherry.
23. Thiru C. D. Dayal. Secretary, Legislative Assembly, Pondicherry.
24. Thiru Rathnaswamy, Editor, Debates, Legislative Assembly, Pondicherry.
25. Dr. Mohan Singh Mehtha, Gujarat.
26. Shri B. N. Choudary, Scientist, K. V. K., New Delhi.
27. Thiru K. Raghunathan, Director of Animal Husbandry, Pondicherry.
28. Thiru J. Deivasigamany, Director, Public Works Department, Pondicherry.
29. Thiru V. Kesava Reddiar, Farmer and Member, Managing Committee, Karaikal.
30. Thiru M. Ramasamy, Farmer and Member, Managing Committee, Karaikal.
31. Tmt. Jeevarathinammal, Member, Managing Committee, Madukarai.
32. Tmt. Saikumari Krishnamoorthy, Social Worker, Madukarai.
33. Thiru John Kuppusamy, Convenor, Farmers' Forum, Ozhavarkarai.
34. Dr. Mariakulandai, Karaikal.
35. Thiru R. Pattabhiraman, Deputy Director of Agriculture (Seed Certification),
36. Thiru Shanmugavelu, Cane Officer, New Horizon Sugar Mills Ltd., Ariyur.
37. Dr. V. S. Sasthry, Rice Breeder, Maruteru.
38. Dr. Bhaskara Rao, Rice Breeder, Maruteru.
39. Dr. M. Karunakaran, Rice Breeder, Pattambi,
40. Dr. V. S. Nayudu, Rice Breeder, Mandya.
41. Dr. Quyan, Gynaecologist, Veterinary College, Madras.

42. Thiru Ramasamy Reddiar, Farmer, Cuddalore.
43. Thiru Imanuel, Leader, Holy Redeemer's Service Training Centre, Pondicherry.
44. Thiru K. T. R. Lakshminarayanan, Farmer, Cuddalore.
45. Thiru Dayanandam, Teacher, Government Secondary School, Mandagadipet.
46. Thiru P. V. Pannirselvam, M. E. (Chem.), I. I. T., New Delhi.
47. Thiru R. Karthigeyan, Farmer, Mettupalayam.
48. Thiru Muthuswamy, Director. Agricultural Experiment Institute, Kudimianmalai.
49. Thiru Kalyanaraman, Joint Director of Agriculture, Madras.
50. Thiru Mathews, Indian Potash, Cuddalore.
51. Thiru Allen, Lake Estate, Aurobindo Ashram, Pondicherry.
52. Thiru R. Ramakrishnan, Farmer, Chidambaram.
53. Thiru Subramania Mudaliar, Farmer, Kadirgamam.
54. Thiru Joseph Annusamy, Social Worker, Pondicherry.
55. Thiru Ramakrishnan, Farmer, Abishepakkam.
56. Thiru Appasamy Udayar, Farmer, Saram, Pondicherry.

KUMARAPERUMAL FARM SCIENCE CENTRE. TRICHIRAPALLI

1. Thiru S. K. Sharma, I F. S , Co-ordinator, Forest Soil Vegetation Survey, Forest Research Institute and College, Dehra Dun, Uttar Pradesh.
2. Dr. P. K. Khosla, Head of the Department of Forestry, Himachal Pradesh, Krishi Viswa Vidyalaya, Oachgat.
3. Thiru B. P. Desai, I. F. S., Director, Maharastra Van Sanshodhan Sanstha, Chandrapur.
4. Thiru K. P. Muniswami, I. F. S. Forest Geneticist. Research and Development Wing, Office of the Chief Conservator of Forests, Hyderabad.
5. Thiru Madan Gopal, I F. S., Co-ordinator, Goverment of India, Indo-Danish Project on Seed Procurement and Tree Improvement, State Forest Department Building, Hyderabad.
6. Thirumathi R. A. Srimathi, Research Officer, Sandal Research Centre, Bengalore.
7. Thiru H. D. Kulkarni, Research Officer, Sandal Research Centre, Bangalore.
8. Thiru K. R. Venkatesan, I. F. S. Conservator of Forests and Co-ordinator, Sandal Research Centre, Bangalore.
9. Thiru S. Shyam Sundar, I. F. S., Conservator of Forests, Research and Utilization Circle, Bangalore.
10. Dr. V. Bhaskar. Assistant Professor, Department of Farm Forestry, University of Agricultural Sciences, Bangalore.

11. Dr. J. C. Jain, Direcror, Forest Research Labortory, Bangalore.
12. Dr. C. S. Venkatesh, Head of the Genetics Division, Kerala Forest Research Institute, Peechi.
13. Thiru T. Achaya, I. F. S., Chief Conservator of Forests, Madras.
14. Thiru G. Kumaravelu, Senior Research Officer, Sylviculture and Soil Science, Forest Research Centre, Coimbatore.
15. Thiru K. Shanmughanathan, I F. S., Principal, Forest College, Coimbatore.
16. Thiru P. Baskaradoss, I. F. S., Principal and Head of Biological Research, Southern Forest Rangers' College and Research Centre, Coimbatore.
17. Dr. S. Bagchi, Senior Research Officer, Indo-Danish Project on Seed Procurement and Tree Improvement, Forest Research Centre, Coimbatore.
18. Thiru K. K. Vakshaya, Indo-Danish Project on Seed Procurement and Tree Improvement, Coimbatore.
19. Thiru T. K. Srinivasan, I. F S., State Forest Geneticist, Coimbatore.
20. Thiru V. Nagarajan, Assistant Sylviculturist, Trichy.
21. Thiru S A. T. Antony, Assistant Conservator of Forests, Trichy.
22. Thiru G. J. Rajasingh, I. F. S., Managing Director, Tamil Nadu Forest Plantation Corporation, Trichy.
23. Thiru B Arul Prakasam, Divisional Forest Officer, Nilgris North Divison, Ootacamand.
24. Thiru N. Vasudevan, Divisional Forest Officer, Trichy.
25. Thiru N. Veeramani, Divisional Forest Officer, Trichy.
26. Thiru K. Somasundaram, Regional Manager. Tamil Nadu Forest Plantation Corporation. Trichy.
27. Thiru P. Balakrishnan, Forest Engineer, Trichy.
28. Thiru K. S. Krishnamachari, Chief Chemist, Seshasayee Paper & Boards Ltd., Erode.
29. Thiru Srinivasa Rathinum, Assistant Forest Officer, Seshasayee Paper & Boards, Erode.
30. Thiru G. Mohanraj, Executive (Forests), South India Viscose Ltd., Coimbatore.
31. Thiru K. M. Dhandapani, Manager, South India Viscose Ltd., Ootacamund.
32. Thiru M. R. Srinivasan, Assistant Manager, South India Viscose Ltd., Coimbatore.
33. Thiru S. Rathinavel, Manager, South India Viscose Ltd., Kodaikanal.
34. Thiru S. Sivarajan, Progressive Farmer, Neikuppai.
35 Mrs. Rajamani, FSC Convenor, Punjais.
36. Tmt. Savithri, FSC Convenor, Panchapatty.
37. Dr. Bhaskaran. M. B. B. S., General Hospital, Trichy.
38. Thiru Subramaniam, Farm Radio Officer, AIR, Trichy.
39. Dr. Raman, Joint Director of Animal Husbandary, Tanjore.

APPENDIX III

SCHEMES FINANCED BY ICAR AND OTHER AGENCIES

Name of Scheme (1)	Location (2)	Total Cost 1980 - 81 (3)
ICAR		
Agronomy		
1. Sheme for research on feasibility of introducing mixed farming with a view to increase income and employment of small, medium aud large scale farmers of beckward areas of Tamil Nadu.	Kaveripattinam Yercaud	1,04,900 97,200
2. Scheme for fixing cropping pattern and agronomic practies for soils integrated with saline water.	Kovilpatti	14,000
3. Scheme for evolving suitable crop combinations for different agro-climatic zones in Tamil Nadu with field and horticultural crops.	Coimbatore	28,000
4. Integrated scheme for water management and soil salinity.	Bhavanisagar Madurai	2,92,800 2,49,000
5. All-India coordinated agronomic research staff at headquarters.	Coimbatore	1,70,100
6. All-India coordinated agronomic research-Model agronomic experiments	Bhavanisagar	75,500
7. All-India coordinated research project for the improvement of wheat	Coimbatore	83,100
Agricultural Botany		
1. All-India coordinated cotton improvement project	Coimbatore	3,000
2. Scheme for Emeritus Scientist	Coimbatore	22,400
3. Scheme for production of nucleus seeds of recently developed groundnut varieties - All-India coordinated research project on oilseeds: Pol. 1 and Pol. 2	Bhavanisagar	19,700
4. Scheme for production of super elite and elite sunflower seed	Bhavanisagar	4,03,300

(1)	(2)	(3)
5. Scheme for production of nucleus seeds of recently developed groundnut varieties - All-India coordinated research project on oilseeds: TMV 10	Vridhachalam	19,700
6. I. D. R. C. research project on sesamum	Virudhachalam	1,33,500
7. Intensification of research and training in pulses and oilseed crops	Aduthurai	1,61,100
	Kovilpatti	87,600
	Vridhachalam	89,500
8. All-India coordinated research project on oilseeds	Coimbatore	7,18,100
9. All-India coordinated research project on oilseeds-Off-season nursery project	Aliyarnagar	1,65,800
10. All-India coordinated research project on oilseeds-Sub-centre for groundnut	Aliyarnagar	86,500
11. All-India coordinated research project on oilseeds-Main centre for groundnut	Vridhachalam	2,08,600
12. All-India coordinated research project on oilseeds-Sub-centre for castor research	Pottaneri	77,400
13. All-India coordinated rice improvement project	Coimbatore	2,74,100
	Aduthurai	2,25,100
	Madurai	27,300
14. All-India coordinated research project for improvement of millets	Coimbatore	1,75,100
15. All-India coordinated research project for improvement of sorghum	Coimbatore	3,03,500
16. All-India coordinated research project on jute and allied fibres	Coimbatore	84,800
17. All-India coordinated cotton improvement project (Breeding and Agronomy parts)	Coimbatore	2,48,300
	Kovilpatti	1,14,700
	Srivilliputhur	2,73,800
18. All-India coordinated research project for intensification of research on the improvement of pulses	Coimbatore	3,76,600
	Vamban	3,80,800
19. All-India research project on soybean	Coimbatore	43,500
20. I. D. R. C. scheme - Project on sesamum	Vridhachalam	2,37,600

Agricultural Entomology

1. Scheme for bionomics and control of mango stemborer *Bactocera reformaculata* in Tamil Nadu	Coimbatore	20,900

(1)	(2)	(3)
2. Scheme for investigation on the resistance to pesticides developed in the *Heliothis armigera* and *Spodoptera litura* on crops in relation to biotype and ecology	Coimbatore	12,200
3. Scheme for studies on the mango nutweevil *Sternochetus maniferae*) with reference to bionomics, varietal incidence and control	Coimbatore	60,300
4. All-India coordinated research project on nematode pests and their control	Coimbatore	1,03,800
Plant Pathology		
1. Scheme for evolving methods to detect bunchy top virus in banana suckers	Thadiyankudisdi	44,000
Horticulture		
1. Scheme for intensification of research on the development of rose and jasmine varieties with high essential oil content	Coimbatore	1,23,500
2. Scheme for research on temperate vegetables	Coimbatore	68,800
3. Scheme for research on improvement of patchouli with reference to nematode resistance	Coimbatore	29,800
4. Scheme for research on temperate vegetables	Kodaikanal	43,200
5. Scheme for research on some selected fruits in the semi arid areas in India	Yarcaud	61,500
6. Scheme for improvement of Vinca and diascorea	Madurai	30,100
7. All-India coordinated research project on tuber crops (other than potato)	Coimbatore	1,15,200
8. All-India coordinated vegetable improvement project (Including chillies)	Coimbatore Kovilpatti	99,100 50,900
9. All-India coordinated fruit improvement project	Coimbatore	4,28,400
10. All-India coordinated improvement project for medicinal and aromatic plants	Kodaikanal	2,23,600
11. All-India coordinated spices and cashew improvement project	Coimbatore Vridhachalam	61,200 78,600
12. All-India coordinated coconut and arecanut improvement project	Veppankulam	2,13,500
13. All-India coordinated fruit improvement project (Citrus Dieback)	Periyakulam	1,76,100

(1)	(2)	(3)
14. All-India coordinated coconut and arecanut improvement project	Coimbatore	46,400
Agricultural Economics		
1. Agro-economic research scheme for drought prone areas	Kovilpatti	45,300
Agricultural Extension and Rural Sociology		
1. Coordinated scheme on national demonstration of major food crops in Madurai district	Madurai	1,33,000
2. Zonal coordinating unit-Lab-to-Land programme for transfer of technology to farmers' families	Coimbatore	27,400
3. Lab-to-Land programme for transfer of technology to farmers' families	Coimbatore	98,400
	Madurai	1,17,200
	Trichy	43,100
	Pondicherry	43,100
	Kaveripattinam	43,100
	Vridhachalam	39,400
	Aduthurai	46,900
Seed Technology		
1. Scheme for breeders' seed production for the National Seeds Project	Coimbatore/ Bhavanisagar	80,000
2. Scheme for studies on the production, processing and storage of seeds of fodder, forage and green manure crops	Coimbatore	35,800
Agricultural Engineering		
1. Ad-Hoc scheme on drip irrigation studies in water scarcity and sandy areas in Tamil Nadu	Coimbatore	7,800
2. Project of technical Co-operation between I.D.R.C. Canada and ICAR, New-Delhi on post-harvest technology	Coimbatore	66,500
3. Scheme on coordinated programme of research of bio-gas technology	Coimbatore	1,39,200
4. Scheme for methods of construction of open-wells and tube wells and deepening the existing open wells under quick sand condition to increase yield	Coimbatore	71,100
5. Scheme for studies on harvest and post-harvest technology	Coimbatore	1,59,500

(1)	(2)	(3)
6. Scheme for energy requirements in intensive agricultural production	Coimbatore	1,14,900
7. All-India coordinated scheme for research and development of farm implements, machinery and production of prototypes and their evaluation under different agro-climatic conditions	Coimbatore	5,52,200
8. Scheme for intensive testing of power tiller, research and development of new machines to make them versatile	Coimbatore	2,18,100
Soil Science		
1. Coordinated project for research on chemistry of submerged soils under rice cultivation in high rainfall areas	Aduthurai	69,600
2. All-India coordinated research project on long-term fertilizer experiments	Coimbatore	59,100
3. All-India coordinated scheme on micro-nutrients of soil	Coimbatore	2,07,000
4. All-India coordinated scheme for studies on measurement, evaluation and improvement of soil physical conditions to increase agricultural production of problematic areas	Coimbatore	1,15,600
5. All-India coordinated scheme for investigation on correlation of soil test with crop responses	Coimbatore	1,63,500
6. All-India coordinated research project for dryland agriculture	Kovilpatti	2,94,800
7. All-India coordinated research project on sugarcane	Cuddalore	68,200
8. Scheme on self-employed rural soil health care workers programme	Madurai	39,500
Agricultural Microbiology		
1. Scheme for investigation on pollution of soil, water and microbial degradation of pollutants	Coimbatore	90,200
2. Scheme on coordinated research on biological nitrogen fixation	Coimbatore	1,69,600
3. Centre for advanced studies in post-graduate agricultural microbiology with FAO/UNDP/ICAR/assistance	Coimbatore	3,49,300
4. Scheme for investigation on the control of snails and slugs of agricultural and horticultural importance	Madurai	27,400

(1)	(2)	(3)
Fishery Science		
1. Scheme for water re-circulation system for fish and prawn culture	Tuticorin	49,600
2. Scheme for energy and nitrogen balance in nutrition and growth of Indian major carps	Tuticorin	35,800
3. All-India coordinated research project on composite culture of Indian and exotic fishes and fish seed production	Tuticorin	47,300
Krishi Vigyan Kendra		
1. Krishi Vigyan Kendra, Trichy	Trichy	6,46,600
Animal Science		
1. Studies on the etiology and pathology of chronic hill haematuria in Tamil Nadu	Madras	76,700
2. Scheme for the study of neoplasms of upper respiratory tract in bovines	Madras	54,600
3. All-India coordinated research project on poultry for meat	Madras	6,40,500
4. All-India coordinated research project on sheep for fine wool	Sandynallah	6,86,100
Government of India		
1. Comprehensive scheme for studying the cost of cultivation of principal crops	Coimbatore	4,57,800
2. Scheme for investigation on the recycling of effluents from sago factories	Coimbatore	31,100
3. Scheme for use of native viral and fungal pathogens in pest control and their safety for beneficial insects and vertebrates	Madurai	46,300
4. Scheme for genetic improvement of *Casuarina equisetifolia* by selection	Trichy	68,200
5. Scheme for cultivation practices (Agronomy) of bamboos in forests and farms	Mettupalayam	71,900
6. Hill Area Development Programme	Sandynallah	2,50,000

(1)	(2)	(3)
Ford Foundation		
1. Study fellowship for staff members	Coimbatore	14,400
Indernational Foundation for Sciences (Sweeden)		
1. Scheme on mycorrhizal association in tropical pines grown in Nilgris	Coimbatore	18,900
2. Scheme for investigation on the relationship between rhizobia and forage legumes	Coimbatore	14,000
3. Scheme for studies on the microbiology of Idli and Dosai fermentation and development of new improved products	Coimbatore	5'000
International Atomic Energy Agency (Vienna)		
1. Scheme for the research project on the effect of pesticides on the metabolic activities of soil microorganisms	Vamban	24,000
Soil Health Foundation (U.S.A)		
1. Research scheme for biofertilizers for increasing crop production	Coimbatore	1,18,700
German Democratic Republic		
1. Project on "K" fertilizers	Coimbatore	25,000
P.L. 480 (USDA)		
1. Scheme for land and water use planning of watershed.	Coimbatore	66,200
2. Scheme for tree improvement in *Eucalyptus tereticornis*	Mettupalayam	1,51,500
3. Scheme for soil conservation measures for dryland based on soil and loss equation	Coimbatore	87,900
4. Scheme for coordinated research programme in solar energy	Coimbatore	1,76,700
UNICEF (New Delhi)		
1. Staff support for university Departments (Human Nutritition)	Coimbatore/Madurai	31,400
South India Viscose Ltd and Seshasayee Paper Boards Ltd		
1. Scheme for tree improvement programme	Coimbatore	1,51,300

(1)	(2)	(3)
ICMF (Bombay)		
1. Scheme for evolution of high yielding short duration medium staple varieties of cotton	Kaveripattinam	93,100
CSIR (New Delhi)		
1. Scheme for investigation on the control of insect pests by using naturally occurring nuclear polyhedrosis viruses	Madurai	12,200
Central Groundwater Board - SIDA (Sweeden)		
1. Scheme for research and demonstration on soil and water management in collaboration with TNAU	Coimbatore	68,500
Tamil Nadu Small Scale Pesticides Manufacturers Association (Madras)		
1. Scheme on testing of pesticides with reference to the bioefficacy, storage and residue studies	Coimbatore	4,61,200
The Stanes & Co., (Coimbatore)		
1. Scheme for testing of chemicals, micronutrients, in-secticides etc	Coimbatore	5,000

APPENDIX IV

BOOKS AND BOOKLETS PUBLISHED

A. MONOGRAPH

English : Monograph on Cotton

B. BOOKS

English : Azolla - A Biofertiliser

Drip Irrigation

Post-graduate Thesis Abstract 1980

Research Highlights 1980

Annual Report 1979-80

Employment Pattern of Labour Force in Coimbatore Taluk

Hand Book 1980

Curricula and Syllabi 1979 (Post-graduate Programme)

Tamil : இலக்கியத்தில் வேளாண்மைக் கலைச்சொற்கள்

C. BOOKLETS

English : Important Pests and Diseases of Rice in Pondicherry State

Tamil : புதுமுறை நெற்பயிர் சாகுபடி

திருந்திய காய்கறி சாகுபடி

தீவனப்பயிர் சாகுபடி

புகையிலையின் நோய்களும் தடுப்பு முறைகளும்

வெற்றிலைக்கொடியின் நோய்களும் தடுப்பு முறைகளும்

பருத்தியின் நோய்கள்

கரும்பின் நோய்கள்

இலக்கியத்தில் நீர்வள நிர்வாகம்

வேளாண்மை நுணுக்கச் செயல்விளக்கக் கையேடு

பாண்டிச்சேரி மாநிலத்தில் நெற்பயிரைத்தாக்கும் முக்கிய பூச்சிகளும், நோய்களும்

D. JOURNALS

English : Madras Agricultural Journal (Monthly)

Tamil : வளரும் வேளாண்மை (மாத இதழ்)

உழவர் துணைவன் (மாத இதழ்)

APPENDIX V

LIST OF SCIENTIFIC PAPERS PUBLISHED

AGRICULTURAL BIOCHEMISTRY

1. Gowri G., and S. Sadasivam. 1980 Ammonia assimilation in greengram nodules. National Symposium on Biological Nitrogen Fixation in Relation to Crop Productivity, Tamil Nadu Agricultural University, p 19.

2. Jayapragasam M., and D. Raj. 1980 Studies on the growth of Azolla-Anabaena symbiotic system. In "Azolla - A Biofertilizer," pp 15-21.

3. Neelakantan S., B. Theymoli, Indira Jasmine and R. Balasaraswathi 1980. Presence of aflatoxin in foods and feeds available in the Tamil Nadu region. Madras agric. J. 68:189-195.

AGRICULTURAL BOTANY

1. Chandramohan, J., A. Saravanan, S. Ramasamy and M. Gopalakrishnan 1980. Performance of rhizobial inoculation in pulse crops in rice fallows of Tanjavur delta. Paper presented at the National Symp. on Biological Fixation of Nitrogen.

2. Chandrasekaran, A. and V. D. Gurusamy Raja. 1980 Mutagenesis in sorghum. Tamil Nadu Agricultural University Newsletter 9: 11.

3. Chandrasekar, N. R 1980. Forachis-a perennial forage groundnut. Paper Presented to National Groundnut Seminar p 248-51.

4. Guruswamy Raja, V. D. Improvement of upland rice. Rice Production Technology Proceedings, June 26, 1980, pp. 9-13.

5. Guruswamy Raja, V. D. Recent trends in establishing cotton yield. Cotton Seminar, September 12, 1980, pp 166-170.

6. Henry Louis, I., and N. R. Chandrasekaran, 1980. A note on the weevil Diocalandra as a pest of coconut palm in Tamil Nadu. Indian Coconut Journal 10:11.

7. Henry Louis, I., and N. R. Chandrasekaran, A. N. Venketeswaran and K. P. Vijayan. 1980. A note on the effect of summer irrigation on dwarf varieties of coconut palm. Indian Coconut Journal 11:7.

8. Kamalanathan, S., M. Kadambavanasundaram, C. P. Thyagarajan and P. K. Ramakrishnan. 1980. Evolution of a new higher yielding variety of cotton MCU 9 in Tamil Nadu. ISCI Journal 5:1:1980.

9. Mahudeswaran. K., P. Rangasamy and S. D. Peter, 1980. Cowpea, a substitute for horsegram. Tamil Nadu Agrl. University Newsletter 9:11, p. 5.

10. Mahudeswaran, K., P. Rangasamy, S. Sivasubramanian and S. D. Peter 1980. A new plant type in redgram. TNAU Newsletter 9:11, p. 5.

11. Marappan P. V., R. S. Annappan, S. Iyemperumal, K. Mahudewaran G. A. Palanisamy and S. Giridharan 1980 Co. 3 Cowpea (*Vigna sinensis* L. sari) A high yielding medium duration variety for Tamil Nadu. Madras Agri. J. 67 (3) : 145-48.

12. Murali, K, and V. S. Raman 1980. Interspecific breeding in *Arachis*. A study of the dynamics of introgression in experimental populations. Paper Presented to National Seminar on Groundnut, p. 59-68.

13. Muralidharan, V., and V. S. Raman 1980. Cross compatibility and reproductive efficiency in hybrids of bunch groundnuts *A. hypogaea* and *A monticola*. Paper Presented to Groundnut National Seminar, p. 146-159.

14. Muralidharan,V., V. S. Raman and A. Narayanan 1980. A case of restricted recombination in *Arachis*. Paper Presented to National Seminar on Groundnut, p. 69-77.

15 Nagarajan, K., and M. N. Prasad, 1980. Studies on genetic diversity in foxtail millet (*Setaria italica*). Madras agric. J. 67 (1) : 28-38.

16. Nagarajan, K., and M. N. Prasad. 1980. Studies on variability correlation and path analysis in foxtail millet *Setaria italica* Beanu. Madras agric J. 67 (4) : 220-27.

17. Narayanan, D., and M. N. Prasad. 1980. Studies on sorghum grain mould resistance. Paper Presented at the 10th Annual Sorghum Research Workshop held at Tamil Nadu Agri University.

18. Nagarajan, K., Studies on variability, correlation and path analysis in foxtail millet (*Setaria italica*) Madras agric. J. 67 (4): 220-227, 1980.

19. Nagarajan, M., Physiology of drought tolerance in rice. Rice Production Technology Proceedings. June 23-26. 1980, pp. 30-34.

20. Narayanan, A., and V. S. Raman. 1980. Metaxenia and certation in groundnut. Paper Presented at National Seminar on Groundnut, p. 100-106.

21. Narayanan, A., V. S. Raman and N. Sundaram, 1980. Breeding for a desirble plant type in groundnut. Paper Presented to National Seminar on Groundnut, p. 175-76.

22. Paramasivam, K. S. 1980. Correlation studies in tall and dwarf indica rice varieties. Madras agric J. 67 (3) : 141-44.

23. Paramasivam, K. S. 1980. Study of pollen and spikelet sterility in the hybrids of tall and dwarf indica rice varieties. Madras agric J. 67(2):122-23.

24. Paramasivan, J., and S. Rajasekaran. Genetic variability in greengram (*Vigna radiata wilczeck*) Madras agric. J. 67 (7): 28-38, 1980.

25. Palanisamy, K. S., and V. S. Raman. 1980. Consequences to hybridism in Spanish and Virginia groundnuts. Oleagineux. 35:311-22.

26. Peter. S. D., J. Chandramohan and M. Suresh. 1980. A superfine rice suitable for Dharmapuri district. Tamil Nadu Agricultural University News letter 9:11, p. 5.

27. Ramachandran, T. K., and A. N. Venkateswaran. 1980. An assessment of a Valencia groundnut. Paper Presented at Groundnt National Seminar, p. 160-170.

28. Ramachandran, T. K., A. N. Venkateswaran, R. S Vinaya Rai and G. Sirnivasan. 1980. An assessment of Gangapuri, a Valensia groundnut. Madras agric. J. 67 (6) : 351-59.

29. Raman, V. S. 1980. Aneuploids in groundnut breeding. Paper Presented to National Groundnut Seminar, p. 78-84.

30. Raman, V. S. 1980. Nature of chromosome pairing in induced polyploids of *Arachis*. Paper Presented to National Seminar on Groundnut, p. 93-99.

31. Raman, V. S., and A. Narayanan, 1980. National hybridization in *Archis*. Paper Presented to National Groundnut Seminar, p. 85-92.

32. Ramanathan, T. 1980. Problems and prospects in groundnut improvement. Paper Presented to National Groundnut Seminar, p. 239-43.

33. Rangasamy, K. Mahudeswaran and S. D. Peter 1980. A High yielding ragi culture for Dharmapuri district, TNAU Newsletter 9:11, p. 5.

34. Rasupandi, M., P. Rangasamy and S. D. Peter 1980. A high yielding cowpea culture. TNAU Newsletter. 10:7.

35. Rathnasamy, R. 1980. Genetic vulnerability and mutation breeding strategy in groundnut. Paper Presented to National Groundnut Seminar pp. 140-145.

36. Sethupathi Ramalingam R. 1980. Problems and prospects in groundnut breeding. Paper Presented to National Seminar in Groundnut pp. 229-31.

37. Soundarapandian, Y. Evaluation of oilseed crop varieties suitable for rainfed blacksoil tracts of Tamil Nadu, 1980 Madras agric. J. 67 (5): 292-294.

38. Soundrapandian, G. High yielding millets for the rainfed black soil tract of Tamil Nadu. Madras agric. J. 67(8):292-299.

39. Sridharan, C. S , and P. V Marappan. 1980. Biometrical studies on the hybrids of bunch groundnut (*Arachis hypogaea* L.) Paper Presented to National Seminar on Groundnut. pp. 39-42.

40. Stephen Dorairaj, M. 1980. Problems and prospects of groundnut breeding in Tamil Nadu. Paper Presented to National Seminar on Groundnut. pp. 222-228.

41. Subramanian, M. Hybridization techniques in rice. Rice Production Technology Proceedings. June, 23-26,1980 pp 26-29.

42. Snndaram, A. A Ramakrishnan, CR. Ranganathan and Sethupathi Ramalingam. Genetic divergence in chilli. Indian J. agric. Sci. 50(5):391-3, 1980.

43. Sundaram, A, A. Ramakrishnan, P. V. Marappen and G. Balakrishnan, Factor Analysis in Cowpea. Indian J. agric. Sci. 50(3):216-8, 1980.

44. Suresh, M., J. Chandra Mohan and S. D. Peter, 1980. Early rice culture 8872. TNAU Newsletter 9:11, p. 2.

45. Suresh, M. and S. D. Peter, 1980. Bund cropping in rice fields. TNAU Newsletter 9:11:2.

46. Thangavelu, S. 1980. Future strategy for groundnut research. Paper Presented to National Groundnut Seminar pp. 232-37.

47 Thangavelu S. Future strategy for groundnut research. Paper Presented at the National Seminar on the Application of Genetics to the Improvement of Groundnut, July 1980, pp. 232-237.

48. Thangavelu S., G. Radhamanoharan and P. Vindhyavarman, 1980. Studies on pod setting in interspecific crosses of *Arachis hypogaea* L. Paper Presented in National Groundnut Seminar pp. 180-184.

49. Venkateswaran, A. N. 1980. Discriminant function as a tool in groundnut breeding. Paper Presented at National Seminar on the Application of Genetics to Improvement of Groundnut. pp. 20-25.

50. Venkateswaran, A. N., T. K. Ramachandran and V. S. Raman, 1980. Some aspects for consideration in breeding groundnut. Paper Presented to National Groundnut Seminar pp. 215-221.

AGRICULTURAL ECONOMICS

1. Aiyasamy, P. K. and S. Kombairaju, "Economics of Gobar Gas Hlant". *Proceedings of the Subjectmatter Training-cum-Discussion Seminar on Biogas Production Technology*, 28th January, 1980.

2. Aiyasamy, P. K. and R. Srinivasan, "Economics of Cotton Production in Tamil Nadu" *Monograph on Cotton*, Tamil Nadu Agricultural University, 1980.

3. Aiyasamy, P. K and C. Ramasamy. "Cotton Marketing" *Monograph on Cotton*, Tamil Nadu Agricultural University, 1980.

4. Balakrishnan, V. "Some Economic Characteristics of Mixed Farming in Coimbatore District", *Madras agric. J.* 67 (3) : 432, 1980.

5. Chidambaram, P., A. Kandasamy and G. Rangarajan, "Marketing of Milk in Erode Taluk. Tamil Nadu" *Indian Journal of Marketing* 10(8) : 32, 1980.

6. Gopalsamy, S. "Need to Rear Cattle Exclusively for Slaughtering" *Indian Express* 515 November, 1980.

7. Gopalsamy, S. and S. Krishnamoorthy "Farm Capital Structure and Productivity" *TNAU Newsletter* 9(10):7, 1980.

8. Narasimhan, V. S. and Sam Manohar "Impact of Long Term Finance" *TNAU Newsletter* 9(12) : 3. 1980.

9. Puhazhendhi, V., and C. Ramasamy, "Block Level Credit Plan for Successful Farm Finance" *Agricultural Banker.*

10. Prabakaran, J., and S. Krishnamoorthy "Level of Living of Fishermen" *TNAU Newsletter* 9(10):3, 1980.

11. Rajagopalan, V. and N. Srinivasan, "Case Method of Teaching in Agricultural Marketing". Paper Presented in the *Seminar on Agricultural Marketing Training* held in Punjab 1980.

12. Rajendran, S. and S. Krishnamoorthy "Economics of Chillies Production" *TNAU Newsletter* 9(10):4. 1980.

13. Rajendran, K., and S. Devarajan, "Institutional Finance and Agricultural Development" *Agricultural Banker*. 9(10:1, 1980.

14. Rangarajan, G. and A. Kandasamy "Landed Cost of Milk" *TNAU Newsletter* 9(12):2, 1980.

15. Rangarajan, G., C. Ramasamy and V. Puhazhendhi, "Milk Production with Cross-bred Cows - A Micro Analysis" *Indian Journal of Agricultural Economics* 34(4):161, 1980.

16. Raveendran, V. "Marketing of Turmeric in Tamil Nadu" - An Analysis of Farmer's Marketing Cost" *Indian Journal of Marketing* 35(4):3, 1980.

17. Selvaraj, P and N. Sukumaran. "Production Cost and Profitability of Pond-raised Fish." Paper Presented at the Seminar on Costal and Inland Fish Culture, Fisheries College, Tuticorin, April 1980.

18. Selvaraj, P. "Indicators of Performance of Co-operatives" *Tamil Nadu Journal of Co-operation*, October, 1980.

19. Sivanandam, R., A. Kandasamy and C Ramasamy "Economics of Forest Plantation - Cashew" *Kisan World*, 7(3):40, 1980.

20. Sivanandam, R., A. Kandasamy and C. Ramasamy "Economics of Forest Plantations - Eucalyptus and Casuarina" *Kisan World* 7(4):33, 1980.

21. Srinivasan, N. "Perspectives of Agricultural Marketing Research" Paper Presented at the *National Seminar on Research Perspectives of Agricultural Economics TNAU* Coimbatore, Dec. 5th, 1980.

22. Subramanian, S. R.. "Information System-What it is and What it Ought to be?" Paper Presnted at the *National Seminar on Research Perspectives of Agricultural Economics* on Dec. 5th 1980 of TNAU, Coimbatore.

23. Subramanian, S. R., "Economics of Tapioca Production and Marketing" Paper Presented at *National Seminar on Tuber Crops Production Technology* TNAU Coimbatore. 1980.

24. Sundaresan, R. "A Study on Variation in Rainfall on Crop Yields" *Madras agric. Journal* 67(8):527-533, 1980.

25. Uthamalingam, G. and A. Kandasamy "Economics of Tapioca Production and Processing" *TNAU Newsletter* 9(10):3, 1980.

26. Varadarajan, S. "Institutional Innovations" Paper Presented at the *National Seminar on Research Perspectives of Agricultural Economics* TNAU Coimbatore on Dec. 5th, 1980.

27. Varadarajan, S., and N. Srinivasan "Livestock and Rural Development" *Indian Journal of Agricultural Economics* 35(4):63, 1980.

28. Varadarajan, S. "Whither Industrial Policy in *India International Industrial Annual* Dec. 1980.

29. Aiyasamy, P. K. "Agricultural Development in Crisis. The Case of Small Farmers" Paper Presented in *National Seminar on Intensification of Credit to Small Farmers and Problems of Financing Them* on 15th February 1981.

30. Gopalasamy, S., and V. Puhazhendhi Role of Institution and Farmers' Problem in Farm Credit" Paper Presented at *National Seminar on Intensification of Credit to Small Farmers and Problems of Financing Them* on Feb, 15, 1981.

31. Ilango, P., M. Chidambaram and A. Arunkumar "Problems ot Farmer Beneficiaries Towards Institutional Finance" Paper Presented at *National Seminar on Intesification of Credit to Small Farmers and Problems of Financing Them* on Feb, 15, 1981.

32. Kubendran, J., and B. Natarajan. "Problems of Tractorisation. Kishan world" 8(2): 20-23, 1981.

33. Raveendran, N. "Export of Turmeric from India "*The Economic Times* 8th Fubruary 1981.

34. Selvaraj, P. Economics of Sunflower Cultivation in a Dryland Region Kisan World 8(1): 27-28, 1981.

35. Varadarajan, S. "The Budget that Looks Up" *Southern Economist*, March 1981.

AGRICULTURAL ENTOMOLOGY

1. Ananthanarayanan, K., and M. Balasubramanian, 1980. Residuce of gamma HCH in sugarcane juice. *Pestology* 4 (10) : 1-31.

2. Ananthanarayanan, K., and M. Balasubramanian, 1980. Distribution and intensity of internode borer of sugarcane, *Chilo sacchariphagus indicus* (K) during different periods of plant growth. The Deccan Sugar Technologists Association 30th Convention Part I. pp. 81-88.

3. Ananthanarayanan, K., and M. Balasubramanian, 1980. Insidence of internode borer, *Chilo sacchariphagus indicus* (K), in relation to its population in sugarcane. The Deccan Sugarcane Technologists Association 30th Convention Part I. pp. 121-126.

4. Azeez Basha, A., and M. Balasubramanian, 1980. Newer chemicals for the control of green poach aphid, *Myzus persicae* Sulz. on chillies. *Pesticides* 14 (5) : 12-13 & 20.

5. Balasubarmanian, G., and M. Balasubramanian, 1980. Control of ragi rusty plum aphid. *Farm Science* 6 : 7-9.

6. Balasubramanian, G., and M. Gopalan, 1981. The role of carbohydrates and nitrogen in cotton verieties in relation to resistance to leafhopper. *Indian J. Ent.* 51 (11).

7. Balasubramanian, G., and M. Gopalan. 1980. Changes in organic acid content of American cotton verieties in relation to resistance to the leafhopper, *Amrasca biguttula biguttua* Ishida. *Science and Culture.*

8. Balasubramanian, G., and Sivaprakasam, K., and M. Balasubramanian. 1980. Economics of Plant protection in rice. (Abstract) p. 20. Seminar on Pest Management in Rice Oct. 30-31, 1980 TNAU.

9. Balasubramanian, M. Economic thereshold of tobacco cutworm. *Spodoptera litura* Fb. (Lepidoptera, Noctuidae) on cotton. Paper Presented in Symposium of Economic Threshold of Key Pests and Use of Synthetic Pyrethroids on Cotton at Nagpur during Sep. 19-20, 1980.

10. Balasubramanian, M. Problems of pests control in irrigated cotton in South India. Paper Presented in Seminar on Cotton in Eighties held on 22.12.80 at Tamil Nadu Agrl. University,

11. Balasubramanian, M. Integrated pest management in cotton. Subject Matter Training-cum-Discussion Seminar on Integrated Pest Management in Cotton. held on 3-7 Feb. 1981 at TNAU Coimbatore pp. 1-10.

12. Balasubramanian, M., and P. Karuppusamy, 1980. Water pan trap with synthetic gossyplur to monitor pink bollworm. Paper Presented in Seminar on Integrated Control of Pests in Irrigated Cotton held at Guntur.

13. Balasubramanian, M. and Sellammal Murugesan., 1980. Synthetic pyrethroids in the control of cotton pests and seed cotton yield. Paper Presented at Symposium on Economic Threshold of Key Pests and Use of Synthetic Pyrethroids on Cotton at Nagpur Sep. 19-20 1980. Abstract p. 129.

14. Balasubramanian, M., R. Natesan and K. Mohanvel. 1980. The effect of diflubenzuron - a chitin inhibitor on *Spodoptera litura* and *Heliothis armigera*. Paper Presented in the Seminar on Integrated Control of Pests in Irrigated Cotton held at Guntur.

15. Balasubramanian, M. and M. Gopalan. Effects of insect growth regulator on the fecundity and hatchability of egg of red cotton bug, *Dysdercus Cingulatus* Fab. (Heteroptera:Pyrrhocoridae) in two generations. *Indian J. agric. Sci.* 50 (12) : 958-960.

16. Chakkaravarthy, G. and M. Balasubramanian. 1980. Control of cotton mite, *Tetranychus telarius*. *Pesticides* 14 (11):19-20.

17. Chokkaravarthy, G., S. Sadakathullah and J. Chandramohan. 1980 Evaluation of different rodenticides for rat control. (Abstact) pp. 45. Seminar on Pest Management in Rice held during Oct. 30-31, 1980, TNAU. Coimbatore.

18. Chakkaravarthy, G , S. Sadakathulla and J. Chandramohan 1980. Breeding and burrowing habits of mole rat, *Bandicota bengalensis*. (Abstract) p. 45. Seminar on Pest Mamangement in Rice held during Oct. 30-31, 1980, TNAU, Coimbatore.

19. Chandramohan, M., M.S. Venugopal, B. Habeebullah and M. Balasubramanian 1980 Evaluation of certain syntheic chemicals against betelvine scale *Lepidosaphes cornutus* (Ramakrishna) *Entomon* 5 (3):163-165.

20. Chelliah, S. 1980. Development of biotypes in rice insect pests (Abstract) p. 25. Seminar on Pest Management in Rice held during Oct. 30-31 at TNAU, Coimbatore.

21. Chelliah, S. 1980. Breeding for insect resistance in cotton. Subject-Matter Training-cum-Discussion Seminar on Integrated Pest Management in Cotton held on 3-7 Feb. 1981 at TNAU, Coimbatore, pp.81-85.

22. Chelliah. S., and E A. Heinrichs. 1980. Varietal resistance in rice. A slide-tape production (Abstract) p. 23. Paper Presented during the Seminar on Pest Management in Rice held during Oct. 30-31, at TNAU Coimbatore.

23. Chelliah, S and E.H. Heinrichs. 1980. Factors affecting insecticide induced resurgence of the brown planthopper, *Nilaparvata lugens* on rice. *Environ Entomol*. 9

24. Chelliah, S. and E.A. Heinrichs. 1980. Influence of insecticide sprays on brown planthopper resurgence. IRRI 5 (2):10-11,

25. Chelliah S. and E.A Heinrichs. Parasitization of BPH eggs in rice treated with foliar insecticides. IRRI. 5 (2):14-15.

26. Chelliah, S., L.T. Fabellar and E.A. Herinrichs. 1680. Effect of sublethal doses of three insecticides on the reproductive rate of the brown planthopper, *Nilaparvata lugens* on rice *Environ. Entomol.* 9

27. Dhandapani, N. and M. Balasubramanian. 1980. Life table for the gram pod borer, *Heliothis armigera* Hb. on three pulse crops. *Proc. Indian Acad. Sci*. 89:575-578.

28. Dhandapani, N. and M. Balasubramanian. 1980. Life table for the gram pod borer, *Heliothis armigera* (Lepidoptera-Noctuidae) on cotton. *J. Ent. Res.* 3:186-190

29. Dhandapani, N. and M. Balasubramanian. 1980. Consumption and utilization of different food plants by *Heliothis armigera* (Hubner) Noctuidae: Lepidoptera). *Entomon.* 5(2) 99-103.

30. Dhandapani, N. and M. Balasubramanian. 1980. Effect of different food plants on the development and reproduction of *Heliothis armigera. Experientia* 36:930

31. Easwara moorthy, Sivagami Vadivelu and T.S. Muthukrishnan. 1980. *Sycophila* sp. (Eurytomidae:Hymenoptera). A new pest of *Jasminum grandiflorum* Linn. *Entomon.* 5 (3):pp.214.

32. Gopalan, M. 1980. Pests of stored rice, losses and control. Subject Matter Training-cum Discussion Seminar in Post-harvest Technology (rice) (Nov 17-22 1980), TNAU, Coimbatore pp. 33-37.

33. Gunasekaran, C.R. and M. Balasubramanian, 1980. Evaluation of certain insecticides in the control of sweet potato weevil, *Cylas formicarius* pp. 151-152. National Seminar on Tuber Crops Production Technology held on 21 & 22 Nov. 1980, Faculty of Horticulture, TNAU, Coimbatore.

34. Jayaraj, S. Ecology-based integrated control of *Spodoptera litura* F. on cotton. Subjectmatter-Training-cum-Discussion Seminar on "Integrated Pest management in Cotton" held on 3.7 Feb. 1981 at TNAU, Coimbatore pp. 11-14.

35. Krishnadoss, D. and A. Abdul Kareem. 1980 Studies on the toxicity of certain insecticides on *Cyrtorhinus livibipennis* (Rent) A mirid predator on brown planthopper *Nilaparvata lugens* (Stalp) 3. (Abstract). Seminar on Pest Management in Rice October 30-31, 1980, TNAU, Coimbatore.

36. Krishnadoss and A. Abdual Kareem. 1980. Efficacy of certain insecticides in the control of the brown planthopper, *Nilaparvata lugens* (Stal) on rice. Abstract p. 4. Seminar on Pest Management in Rice Oct. 30-31 1981 TNAU, Coimbatore.

37. Krishnadoss, D. and S. Thirumurthy. 1980. Control of rice earhead bug. (Abstract) p.9. Seminar on Pest Management in Rice held during Oct. 30-31, 1980 at TNAU, Coimbatore.

38. Kuppusamy. S. and M. Balasubramanian. 1980. Efficacy of synthetic pyrethroids against brinjal fruit borer, *Leucinodes orbonalis* Guen. *South Indian Hort.* 28 (3):91-93.

39. Mahadevan, N.R. and M. Balasubramanian. 1981. Efficacy of some newer insecticides against tobacco caterpillar, *Spodoptera litura* F. and green peach aphid. *Myzus persicae* on tobacco *Pestology* 5 (1):20-21.

40. Mahadevan, N. R. and T Kumaraswami. 1980. A note on the effectiveness of nuclear polyhedrosis virus against *Spodoptera litura* (Fabricius) on blackgram, *Phaseolus mungo* (R.) *Madras agric. J.* 67(2) : 138-140.

41. Manohar, S. and M. Balasubramanian 1980. A note on the hymenopterous parasite of agromyzid stemfly, *Ophiomyia phaseoli* Tryn. (Diptera: Agromyzidac) on blackgram. *Madras agric. J.* 67 (5) : 350 351.

42. Manohar, S. and M. Balasubramanian. Dissipation of monocrotophos residues in blackgram husk and grains. Madras agric. 7. 67 (4) : 256-260, 1980.

43. Manonar, S., and M. Balasubramanian. 1981. Residues of monocrotophos in blackgram pods and grains. *Pesticides* 15 (2) : 35-36.

44. Mohanasundaram, M. Indian eriophyid studies-I. Indian J. Acar., 4 (1) : 1-9, 1980.

45. Mohanasundaram, M. Indian eriophyid studies II. Mysore J. agric. Sci. 14 515-528, 1980.

46. Mohanasundaram, M. Four nsw species of eriophyid from South India. *Oriental Insects* 14 (3) : 371-378, 1980.

47. Manohar, S. and M. Balasubramanian. Residues of monocrotophos in blackgram pods and grains. *Pesticides* XV (2) : 35-36, 1981.

48. Natarajan, K. and K. C. Chandy. 1980. Screening of brown planthopper resistance. *IRRN*. 5 (4): 7-8.

49. Natarajan, K. and S. Jayaraj. 1980. Effect of time of planting and the associated weather factors on the incidence of rice gall midge, *Orseolia oryzae* (Wood Mason), Mani. (Abstract) p. 38 Seminar on Pest Management in Rice held during Oct. 30-31, 1980.

50. Natesan, R., and M. Balasubramanian. 1980. Effect of diflubenzuron on pupae on tobacco caterpillar, *Spodoptera litura* F. *Entomon* 5 : 211-213.

51. Natesan, R., and M. Balasubramanian. 1980. Chemical control of turmeric thrips, *Panchaetohrips indicus* Bagnall. *South Indian Hort.*

52. Natesan, R., and R. Velusamy and Chelliah. 1980. Effect of diflubenzuron on rice leaf folder *Cnaphalocrocis medinalis* and rice grasshopper *Oxya nitidula* (Abstract) p. 43. Seminar on Pest Maaagement in Rice held during Oct. 30-31. TNAU, Coimbatore.

53. Natesan, R., R. Veluswamy, S. Chelliah and M. Balasubramanian. 1980. Leaf folder control through interference in chitin biosynthesis. *IRRN*. 5 (6) : 16.

54. Parameswaran, S. 1981. Cotton stem weevil *Pempherulus affinis* (Fst.) and its management. Subject Matter-cum-Discussion Seminar on 'Integrated Pest Management in Cotton' held on 3-7 Feb. 1981 at TNAU, Coimbatore pp. 33-37.

55. Parameswaran, S , and M. Balasubramanian. 1980. Evaluation of some insecticidal treatments for the control of cotton ash weevil grub, *Myllocerus Undecimpustulatus*. *Pestology* 11 : 20-21.

56. Parameswaran, S. and M. Balasubramanian. 1980. An attempt to reduce the insecticide imput in cotton protection. *Pestology*.

57. Rabindra R. J. 1981. Identification of cotton pests. Subject - Matter Training-cum-Discussion Seminar on "Integrated Pest Management in Cotton" held on 3-7 Feb. 1981 at TNAU, Coimbatore pp. 15-23.

58. Rabindra, R. J , and M. Balasubramanian. 1980. Observations on an induced epizotic of nuclear polyhedrosis of *Amsactal albistriga Curr Sci*. 49: 279.

59. Rabindra R. J and M. Balasubramanian. 1981. The effect of diflubenzuron castor semilooper *Achoea janata* Lin. (Lepidoptera, Noctuidae). *Entomon* 6 (1) : 15-18.

60. Raghavendra Rao. J., K. Saivaraj and M. Balasubramanian. 1980. Effect of carbofuran and phorate on the growth and nodulation in cowpea. Paper Presented in National Symposium on Nitrogen Fixation and Crop Production held at TNAU, during Dec. 29-31 1980. Abstract pp. 84.

61. Rajendran, B. and M. Gopalan. 1980. Juvenile hormone like activity of certain plant extracts on *Dysdercus cingulatus* Fab. (Heteroptera : Pyrrohocoridae). *Indian J. agric. Sci.* 50 (10) : 781-784.

62. Rajukkannu, K., S. Chelliah, M. Balasubramanian and P. Vasudevan. 1980. Carbofuran in rice pest control. (Abstract) p. 8. Paper Presented in the Seminar on Pest Management in Rice held during Oct. 30-31, 1980 at TNAU, Coimbatore.

63. Rajkkannu, K., K. Saivaraj, P. Vasudevan and M. Balasubramanian. 1980. Residues of certain newer insecticides in brinjal. *Pesticides* 44 (1) : 15-17

64. Regupathy, A. 1980. Effect of soil application of insecticides on cardamom stem borer, *Dichocrocis punctiferalis* Guen. Proc. II *Annual Symp. Plantation Cr.* (PLACROSYM II Plant and Crop Protection) June 1979. Nilgiris pp. 284-88.

65. Regupathy, A. 1980. Evaluation of certain systemic poisons as pseudostem idjection against banana aphid, *Pentalonia nigroervoss* Coq. *Pestology* 4 (7) : 25-26.

66. Regupathy, A. 1981. Sucking pests of cotton and their management. Subject-Matter Training-Cum-Discussion Seminar on 'Integrated Pest Management in Cotton' held on 3-7 Feb. 1981 at TNAU, Coimbatore pp. 24-32.

67. Regupathy, A. and A. Chamy, 1980. Light trap catches of rice yellow stem borer moth in rice summer cotton area (Abstract) p. 17. Paper Presented during the Seminar on Pest Management in Rice held during Oct. 30-31, 1980 at TNAU, Coimbatore.

68. Regupathy, A. and M. Kulasekaran. 1980. Studies on the possibilities of bunchy top disease containment in Palneys through vector control. Proc. National Seminar on Banana Production Technology TNAU, Coimbatore July 18-19 1980 pp. 150-154.

69. Regupathy, A , and G. Paranjothi. 1980. Evaluation of certain insecticides against diamond back month *Plutella xylostella* Curtis. on cauliflower seed crop. *Pesticides* 14(2) 30-31.

70 Regupathy, A., and K S. Subramanian. 1980. Studies on the combined use of insecticide and weedicide in banana bunchy top disease management programme. Seminar on Diseases and Manuring of Plantation Crops", AC&RI, Madurai May 29. 1980 pp. 6-8.

71. Regupathy, A , and T. R. Subramaniam. 1980. Efficacy of aldicarb in relationship to the time of its application to control aphids and leafhoppers on MCU 5 cotton. *Indian J. agric. Sci.* 50(1):82-83.

72. Regupathy, A., and T. R. Subramaniam Performance of wax and lac coated aldicarb granules against aphids and thrips on cotton. *Indian J. agric. Sci.* 50 (10):788-791.

73. Regupathy, A. and T. R Subramaniam. 1981 Effcet of soil application of aldicarb on cotton. *Cotton. Dev.* 10:17-19.

74. Sadakathulla, S., K. C. Chandy and J. Chandramohan. 1980. Evaluation of insecticides and seedling root dip against rice pests (Abstract.) p. 6. Paper Presented during the Seminar on Pest Management in Rice held during Oct. 30-31, 1980 at TNAU, Coimbatore.

75. Sadakathulla, S., K. C. Chandy and J. Chandramohan 1980. Insecticide dust formulations against the major pests of rice (Abstract) p. 9. Paper Presented during the Seminar on Pest management in Rice held during Oct. 30-31, 1980 at TNAU, Coimbatore.

76. Santharam, G. 1980 Use of nuclear polyhedrosis virus (NPV) for the control of *Spodoptera litura* (F). Subject matter Training-cum Discussion Seminar on Integrated Pest Management in cotton'' held on 3-7 Feb. 1981 at TNAU, Coimbatore pp. 65-69.

77. Santharam, G. and M. Balasubramanian. 1980. Control of *Spodoptera litura* (Lepidoptera: Noctuidae) on tobacco with nuclear polyhedrosis virus and diflubenzuron. *Ind. J. Agri. Science* 50: 726-727.

78. Santharam, G., A. Regupathy and M. Mohanasudaram. 1980. Studies on insecticidal control of cumbu shootfly *Atherigona approximata* M. *Andhra agric. J.* 27.

79 Saivaraj, K., and M. S. Venugopal. 1980. Influence of carbofuran and mephosfolan on plant growth (Abstract) p. 10. Paper Presented during the Seminar on Pest Management in Rice held at TNAU, Coimbatore, Oct. 30-31, 1980.

80. Saivaraj, K., B. Habeebulla, G. Balasubramanian and M. Balasubramanian 1980. Insecticide residues in ragi. *Madras agric. J.* 67(3):192-193.

81. Sellammal Murugesan, 1981. Scouting and forecasting of cotton pests. Subject - Matter Training-cum-Discussion Seminar on Integrated Pest management in cotton held on 3-7 Feb. 1981 at TNAU, Coimbatore. pp. 46-50.

82. Sellammal Murugesan and M. Balasubramanian. 1980. Effect of synthetic pyrethroids alone and in alternation with one organophosphate insecticide in the control of bollworm of cotton. *Pestology* 4 (10):17-20.

83. Sellammal Murugesan, S. Parameswaran and M. Balasubramanian. 1980. Synthetic pyrethroids in the control of cotton pests. Paper Presented in the Seminar on Integrated Control of Pests in Irrigated Cotton held at Guntur.

84. Sivapprakasam, K., G. Balasubramanian and M. Balasubramanian. 1980. Role of surveillance in pest management in rice in Coimbatore and Periyar districts (Abstract) p. 19. Paper Presented in Seminar on Pest Management in Rice during Oct. 30-31, 1980 held at TNAU, Coimbatore.

85. Sivagami Vadivelu. 1980. Mite and nematode pest complex in *Polyanthes tuberosa* Linn. *South Indian Hort.*

86. Sivagami Vadivelu. 1981. Usage of combination of pesticides, fertilizers and micronutrients on cotton. Paper Presented during Subject-Matter Training cum-Discussion Seminar on Integrated Pest Management on Cotton held on 3-7 Feb. 1981 at TNAU, Coimbatore.

87. Sivagami Vadivelu and T. S. Muthukrishnan. 1981. Inlufence of soil texture and moisture on *Pratylenchus delattrae* Luc. 1958. *Population*. Third All India Symposium in Nematology held during 13th-15th Feb. 81 at TNAU, Cbe. Abstract p. 11.

88. Sivagami Vadivelu and T. S. Muthukrishnan. 1981. Pathogenicity of *Pratylenchus delattrae* Luc. 1958. to crossandra with special reference to biochemical attractions. Third All - India Symposium in Nematology held during 13-15 Feb 1981 at TNAU, Coimbatore (Abstract p. 22).

89. Sivagami Vadivelu and T. S. Muthukrishnan. 1980. Nematodes of crossandra in Tamil Nadu. Paper Presented in National Seminar on Production Technology for Commercial Flower Crop during Aug. 29-30 1980 at TNAU, Coimbatore.

90. Subramaniam, T. R. 1981. Pest monitoring and threshold concept in cotton pest management. Subject-Matter Training-cum-Discussion Seminar on Integrated Pest Management in Cotton held on 3-7 Feb. 1981 at TNAU, Coimbatore pp. 51-64.

91. Sundara Babu, P. C. and Sivagami Vadivelu. 1980. Control of crossandra whitefly, *Lipaleyrodes crossandra*. *Pestology* 4 (3) 14-15.

92. Swamiappan, M and M. Balasubramanian. 1980. Studies on mass multiplication and potentiality of *Cohelonus blackburni* Cam. a braconid parasite of cotton bollworm. *Entomon* 5 (1) 73-75.

93. Swamiappan, M., and M. Balasubramanian. *Simplicia caenensalis* Wik. (Noctuidae) as a pest of dry palm leaves in thatched sheds in Tamil Nadu. *J. Bombay Nat. Hist. Soc.* 76 (3) : 538-539.

94. Thamburaj, S. and S. Kuppusamy. 1980. Varietal response to scales in tapioca pp. 90-92. National Seminar on Tuber Crops Production Technology, 21 amd 22 Nov. 1980. Faculty of Horticulture. TNAU, Coimbatore.

95. Velayutham, B. and S. Jayaraj. 1980. Studies on the resistance in rice to blue leafhopper, *Zygina maculiforns* (Mtosch.) (Abstract) p. 24. Paper Presented in Seminar on Pest Management in Rice held during Oct. 30-31st 1980-81 at TNAU, Coimbatore.

96. Velusamy, R. and S. Chelliah. 1980. Rice resistance to thrips. *IRRN* 5 (1) : 7.

97. Velusamy, R. and S. Chelliah 1980. Estimation of honeydew excretion by brown planthopper. A rapid method to evaluate field resistance in rice (Abstract) p. 27. Seminar on Pest Management in Rice held during Oct. 30-31, 1980 at TNAU, Coimbatore.

98. Venugopal, M. S. and J. A. Litsinger. 1980. Dilemma for rice pest managers - Carbofuran a phytotonic insecticide. (abstract) p. 10. Seminar on Pest Management in rice held at TNAU, Coimbatore-3, Oct. 30-31, 1980.

99. Uthamasamy, S. and T. R. Subramaniam. 1980. Studies on host resistance in certain okra varieties to the leafhopper, *Amrasca devastans* (Dist.) (Cicadellidae : Homoptera). *Pestology* IV : (5) : 47.

100. Uthamasamy, S., S. Thirumurthi and D. Krishnadoss. 1980 Influence of light traps in attracting rice gall midge and brown planthopper and its natural enemies (Abstract) p. 39. Seminar on Pest management in Rice, held at TNAU, Coimbatore during Oct. 30-31, 1980.

101. Uthamasamy, S., S Thirumurthi and T. Kumaraswami. 1980. Pest management in rice with particular reference to brown planthopper, *Nilaparvata lugens*. in Madurai district. (Abstract) p 36. Seminar on Pest Management in Rice held at TNAU, Coimbatore during Oct. 30–31, 1980.

AGRICULTURAL EXTENSION AND RURAL SOCIOLOGY

1. Subramanian, V. S. and A. John Knight. 1980. Concensus between researchers and extension workers. TNAU Newsletter. Feb. 9 : 9.

2. Ganesan, R., A., A. John Knight and G Perumal. 1980. Subject-matter training needs of Gramsevaks Ind. J of Extn. Edn. 16 : 6, 1 & 2.

3. Sripal, K. B 1980. Adoption behaviour of small and affluent cotton growers. Reporter, July, 6 : 2.

4. Pushkaran, P. S., and A. John Knight. 1980 Preferential choice of information sources of poultry farmers. Vikalpa, July, 5 : 3.

5. John Knight, A., R. Annamalai and M. Anantharaman. 1980. Credit behaviour of ragi farmer Reporter, Sep. 6 : 5.

6. John Knight, A. 1980. Looking again at agricultural journalism. Communicator, Oct.

7. John Knight, A., R. Annamalai and M. Anantharaman. 1980. Technological gap among Ragi cultivators. Reporter, Oct., 6 : 6.

8. John Knight, A. and D. Somasundaram 1980. Small farmers' preference for radio programmes and modes of their presentation. Ind. J. of Extn. Edn. 16 : 12, 3 & 4

9. Annamalai, R. and A. John Knight, 1980. CBD to transmit technical know-how. TNAU Newsletter, Dec., 10 : 7.

10. Perumal, G. and K. Radhakrishna Menon. 1981. Study to improve Training and Visit System. Indian Express, March, 26.

11. Radhakrishna Menon, K. and R. Ganesan. 1980. Women Farmer Discussion Groups, Voluntary Action, 23 : 9, 382-383.

12. Ganesan, R., A. John Knight and G. Perumal. 1980. Subject-matter Training Needs of Gramsevaks. Ind. J. of Extn. Edn. 16 : 2, 1 & 2, 51-54.

AGRICULTURAL MICROBIOLOGY

1. Balasubramanian, A. 1980. Influence of application of chemicals on the *Azotobacter* population in the rhizospheres of *Sorghum vulgare* and *Crotalaria juncea*. Aspects of Biological Nitrogen Fixation, UAS Tech. Series No. 28. pp. 125-132/

2. Balasubramanian, A., and R. Narayanan. 1980. Effect of insecticides on growth IAA production and nitrogen fixation of Azotobacter chrooccum. Aspects ot Biological Nitrogen Fixation UAS Tech. Series. No. 28. pp. 179-182.

3. Balasubramanian, A., and Sekar, T. 1980. Effect of pesticides on the growth, IAA production and nodulation by *Rhizobium* sp. Aspects of Biological Nitrogen Fixation. UAS. Tech. Series. No. 28. pp. 143-147.

4. Balasubramanian, A., and Sekar, T. 1980. Influence of soil applied pesticides on the translocation of foliar appiied ^{14}C glucose to the root nodules of *Vigna sinensis*. Aspects of Biological Nitrogen Fixation. UAS. Tech. Series No. 28. pp. 148-150.

5. David Ravindran, A , and M. Rangarajan 1980. Growth and respiration of three rehizobial strains of blackgram as influenced by hydrogen ion concentration. Abst. National Symp. Biol. Nitrogen Fixation in Relation to Crop Production, TNAU., Coimbatore, p. 18.

6. David Ravindran, A., and M. Rangarajan. 1980. Effect of soil salinity on *Rhizobium* blackgram symbiosis. Abst. National Symp. Biol. Nitrogen Fixation in Relation to Crop Production, TNAU., Coimbato.e. p. 64.

7. Doraisamy, P. D., Kandasamy. and G. Oblisamy. 1980. Phyllosphere microflora of mulberry as influenced by dust pollution. Abst. National Symp. Sericultural Sci., TNAU., Coimbatore, p. 29.

8. Gunaseelan, G., and Kandasamy. 1980. Effect of solid wastes from industries on nodulation, growth and yield of cowpea. Abst. National Symp. Biol. Nitrogen Fixation in Relation to Crop Production, TNAU. Coimbatore, p. 67.

9. Gunasekaran S. and D. Purushothaman, 1980. Nitrogen fixation by Azospirillum in the rhizosphere of cotton. National Symp. on N Fixation TNAU, Coimbatore 29th - 31st Dec. 1980.

10. Jayachandran, S. and Jeganathan, G. 1980. Effect of different insecticides on the antibiotic resistant mutants of *Rhizobium* sp. Aspects of Biological Nitrogen Fixation. UAS. Tech. Series. No. 28 pp. 136-142.

11. Jayachandran, S., G. Jeganathan, and C. V. Govindaswamy. 1980. Effect of different insecticides on *Azotobacter* isolate obtained from the rhizosphere of C_4 plants. Aspects of Biological Nitrogen Fixation. UAS Tech. Series No. 28. pp. 167-172.

12. Jeganathan, G., S. Jayachandran. and C. V. Govindaswamy. 1980. Effect of Lossa and Tak. E. 25 on *Rhizobium* greengram symbiosis. Aspects of Biological Nitrogen Fixation, UAS Tech. Series. No. 28. pp. 155-159.

13. Kandaswamy, D , K. Chandran., G. Oblisami and M. Balasubramanian. 1980. Variation in the degradation of disyston by *Azotobacter chrooccum* and *Aspergillus niger* Aspects of Biological Nitrogen Fixation, UAS. Tech. Series. No. 28. pp 177-178.

14. Kandaswamy. D., Narayanan, R. and Oblisami, G. 1980. Effect of cement kiln dust pollution on certain crop plants and soil microbial activities. Paper acepted at the 5th International Clear Air Congress held at Beunos Aires, Argentina during october 20-26. 1980.

15. Kandaswamy, D., and Prasad, N. N. 1980. Studies on certain factors influencing legume - rhizobia interrelationships VII. Total nitrogen, organic carbon and C/N ratio of root material. Aspects of Biological Nitrogen Fixation, UAS. Tech. Series. No. 28. pp. 26-30.

16. Muthukrishnan, P., and G. Oblisami. 1980. Vesicular arbuscular mycorrhizal association in mulberry Abst. National Symp. Sericultural Sci., TNAU, Coimbatore, pp. 26.

17. Muthukrishnan, P., and Rangarajan, M. 1980. Synergistic effects of four granular insecticides and *Rhizobium* treatment on the nodulation and yield of blackgram. Aspects of Biological Nitrogen Fixation, UAS. Tech. Series. No. 28. p. 133-135.

18. Muthukrishnan, P., M. Rangarajan. and P. V. Marappan. 1980. Effect of yellow mosaic virus disease on nodulation and yield of horsegram. Aspects of Biological Nitrogen Fixation, UAS. Tech. Series. No. 28. pp. 164-166.

19. Narayanan, R., G Rajannan., D. Kandaswamy. and G. Oblisami. 1980. Interaction between the pollutants of certain factors and the growth of nitrogen fixing organisms in relation to crop production, TNAU., Coimbatore, p. 82.

20. Natarajan, T., and G. Oblisami 1980. Effect of bacteria inoculants on maize Abst. National Symp. Biol. Nitrogen Fixation in relation to Crop Production, TNAU, Coimbatore. p. 24.

21. Natarajan, T., P. Santhanakrishnan and G. Oblisami. 1980. Response of rice varieties to *Azotobacter* and *Azospirillum* inoculants. Abst. National Symp. Biol. Nitrogen Fixation in Relation to Crop Production, TNAU, Coimbatore, p. 25.

22. Natarajan, T., P. Santhanakrishnan., T. Thamburaj., K. G. Shanmugavelu. and G. Oblisami. 1980. Effect of zero tillage and organic mulch on the microflora of soil grown with Tapioca, Proc. National Seminar on Tuber Crops TNAU, Coimbatore, pp. 43-46.

23 Natarajan. T., Sp. Sundaram., P. Santhanakrishnan. and G. Oblisami. 1980. Effect of *Azolla pinnata* on rice varieties in *Azolla- Abiofertilizer* Tamil Nadu Agricultural University, Coimbatore pp. 27-32.

24. Natarajan, T., T. Thangaraj and G. Oblisami. 1980. Effect of combined inoculants of rhizobium and phosphobacteria on frenchbeans and peas. Abst. National Symp. Biol. Nitrogen Fixation in Relation to Crop Production, TNAU, Coimbatore, p. 63.

25. Oblisami. G., K. Balaraman and T. Natarajan 1980. Nodulation pattern in certain germplasm collection of blackgram and greengram. Abst. of Biological Nitrogen Fixation, UAS Tech. Series. No. 28. p. 15.

26. Oblisami, G., and G. Pathmanaban. 1980. Effect of particulate pollutants from cement kiln on the peanut-microflora interrelationship. Paper Accepted at the 5th International Clean Air Congress held at Buenos Aires, Argentina during October 20th-26th, 1980.

27. Oblisami, G., P. Santhanakrishnan., K. Balaraman. and N. Ramadoss. 1980. Effect of bacterization with consoned inoculants on cement. Aspects of Biological Nitrogen Fixation. UAS. Tech. Series. No. 58: 102-105.

28 Oblisami, G., P. Santhanakrishnan, and J. Chandramohan. 1980. Effect of bacterization on rice crop. Aspects of Biological Nitrogen Fixation, UAS Tech. Series. No. 28, pp. 79-82.

29. Oblisami, G., P. Santhanakrtshnan. and Sp. Sundaram. 1980., Screening of germplasm collection of rice for nitrogenase activity in the rhizosphere Abst. National Symp. Biol. Nitrogen Fixation is Relation to Crop Production TNAU, Coimbatore, p. 88.

30. Palaniappan, S. P., and A. Balasubramanian. 1980. Influence of Basalin on rhizosphere microbiol activities, nodulation and nitrogen fixation of cowpea. Abst. National Symp. Biol. Nitrogen Fixation in Relation to Crop Production, TNAU., Coimbatore, p. 88.

31. Palaniappan, S. P. and A. Balasubramanian. 1980. Effect of Basalin on metabolic activities of a *Rhizobium* sp. Abst. National Symp. Biol. Nitrogen Fixation in Relation to Crop Production, TNAU., Coimbatore, p. 93.

32. Prabakaran, J., and M. Rangarajan. 1980. Variation in response of bengalgram genotypes to native and introduced rhizobial strains. Abst. National Symp. Biol. Nitrogen Fixation in Relation to Crop Production, TNAU, Coimbatore, p. 7.

33. Prabakaran. J., and M. Rangarajan. 1980. Performance of multistrain rhizobial inoculants on different pulse crops under irrigated and rainfed conditions. Abst. National Symp. Biol. Nitrogen Fixation in Relation to Crop Production, TNAU, Coimbatore, p. 12.

34. Purusothaman, D., and N. Dhanapal. 1980. Nitrogen fixation by *Azotobacter* occuring in the rhizosphere of certain tropical plant species. Aspects of Biological Nitrogen Fixation, UAS Tech. Series. No. 28. pp. 112-119

35. Purusothaman. D., and S. Gunasekaran. 1980. Nitrogen fixation by *Azospirillum* in the rhizosphere of cotton. Abst. National Symp. Biol. Nitrogen Fixation in Relation to Crop Production, TNAU, Coimbatore, p. 27.

36. Purusothaman, D., and S. Gunasekaran. 1980. Certain ecological and physiological studies on *Derscia geemmosa*, a free living nitrogen fixing bacterium. Abst. National Symp. Biol. Nitrogen Fixation in Relation to Crop Production, TNAU, Coimbatore, p. 76.

37. Purusothaman, D., and S. Gunasekaran. 1980. Certain ecological and physiological studies on *Derscia geemmosa* a free living nitrogen fixing soil bacterium. National Symp. on Nitrogen Fixation TNAU, Coimbatore, 29th-31st Dec. 1980.

38. Purusothaman, D., and S. Gunasekaran. 1980. Nitrogen fixation by Azospirillum in some tropical plants. Proc. Indian National Science Acad. B. 4U: 713-717, 1980.

39. Purusathaman, D., B. Thayumanavan. and S. Gunasekaran. 1981. Assimilation of ammonia in *Azospirillum brasieense* Tarrand etal, Current Science 50 : 498-499.

40. Radha, N.V,. T. Natarajan, T.S. Muthukrishnan and G. Oblisami 1980 Effect of antibiotics on mulberry silkworm growth and productivity Abst National Symp Sericultural Science TNAU, Coimbatore p 48.

41. Ranghavendra Rao, J., K. Saivaraj and M. Balasubramanian. 1980. Effect of Carbofuran and phorate on the growth and nodulation in cowpea (Vigna sinensis) Abst National Symp Biol Nitrogen Fixation in Relation to Crop Production, TNAU, Coimbatore p 84

42. Rajasekaran, P. 1980. Microbial digestion of poultry and fish farm wastes for energy. Proc. National Seminar Agrl. Wastes Ulilisation TNAU Coimbatore.

43. Rajasekaran, P. 1980 Microbial digestion of paddy husk in relation to energy. Paper Presented at the Subject Matter Training-cum-Discussion Seminar on Post-Harvest Technology (Rice) held at TNAU at 21 Nov. 1980 Published in Seminar Vol. Coimbatore 9/80 p. 43-46.

44. Rajasekaran, P. 1980. Biogas production through digestion of sewage sludge. Madras Agrl. Journal 67(5) 337-339.

45. Rajasekaran, P. 1981. Recycling of wastes for biogas production Paper Presented at the Training-cum-Discussion. Seminar on Biogas Production held at KVK Pandicherry from 27th to 31st Jan. 1981.

46. Rajasekaran, P. 1981. Production of energy and non-offensively smelling manure from biogas plants. Paper Presented at the Training-cum-Discussion Seminar on Biogas Production held at KVK Pandicherry from 27th to 31st Jan 1981.

47. Rajasekaran, P., and G. Oblisami. 1980. Recycling of silkworm wastes for biogas generation. Abst National Symp Sericultural Science TNAU Coimbatore p 71.

48. Rajasekaran, P. and M. Sampathkumar 1980. Survival of *Azotobacter* sp. during the process of decomposition of sewage sludge incorporated wastes materials. Paper Presented at XXI Annual Conference of AMI held fram Oct 31 to Nov. 2.1980 p 8. Session E4 P1 of Abstract.

49. Rajasekaran, P. and M Sampathkumar. 1980. Distribution of microbial population during decomposition of sewage sludge treated with waste materials. Paper Presented at XXI Annual Conference of AMI held from Oct. 31 to Nov. 2.1980 p 8. Session E5 P1 of Abstract.

50. Rajasekaran, P. and K.R. Swaminathan 1980. Production of energy and non-offensively smelling manure through digestion of various wastes.

Paper Presented at XXI Annual Conference of AMI held at Andheri, Bombay between Oct. 31 and Nov. 2.1980 page 8. Session E6 P II of Abstract

51. Rajasekaran, P. and K.R. Swaminathan. 1980. Effect of fish and chicken wastes on the microbial population and biogas generation. Paper Presented at XXI Annual Conference of AMI held at Andheri, Bombay between Oct. 31st and Nov. 2nd 1980 page 8. Session E6 P II of Abstract.

52. Rajasekaran, P. and G. Oblisami. 1980. Effect of turmeric treatment on the distribution of microbial population in sewage water utilised for fish culture. Paper Presented at XXI Annual Conference of AMI held at Andheri, Bombay between Oct 31st and Nov. 2nd 1980. Page 10. Session I P II of Abstract.

53. Rangarajan, M and P. Muthukrishnan 1980. Response of native and introduced strain of *Rhizobium sp* on the nodulation and yield of different varieties of blackgram and greengram. Paper Presented at the 3rd Southern Regional Conference on Microbial Inoculants in Crop Production held at UAS, Bangalore on April 1,2 No 28 p 9.

54. Rangarajan. M. and J. Prabakaran 1980. Screening of rhizobial strain for their efficency on nodulation and seed yie d of different pulse crops Abst National Symp Biol Nitrogen Fixation in Relation to Crop Production, TNAU Coimbatore p 3.

55. Rangarajan, M. and J. Prabakaran. 1980. Studies on the interaction between rhigobial strains and different varieties of bengalgram. Abst. National Symp Biol. Nitrogen Fixation in Relation to Crop Pproduction, TNAU, Coimbatore p 8.

56. Rangarajan, M., J. Prabhakaran and R.S Annappan. 1980. Differential responses of genotypes of cowpea and blackgram to native rhigobia. Paper Presented in the Fifth Southern Reginal Conference on Microbia Inoculants in Crop Pro uction held at ICRISAT Hydrabad between 20th and 22nd March 1980.

57. Rangarajan, M., J Prabakaran and G. Oblisamy 1980. Cnmparative performance of single and multi strains rhizobia in different varieties of pulses Paper Presented in the Fifth Southern Regional Conference on Microbial Inoculants in Crop Production held at ICRISAT Hyderabad between 20th and 22nd March 1980.

58. Sampathkumar, M. and P. Rajaockaram. 1980. Effect of *Azotobacter* inoculation on the nitrogen enrichment of sewage sludge treated agricultural wastes Abst National Symp Biol Nitrogen Fixation in Relation to Crop Production TNAU Coimbatore p 80.

59. Santhanakrishnan, P., P. Balaraman, K. Ramdoss and G. Oblisami. 1980. Effect of combined inoculants on potato. Aspects of Biological Nitrogen Fixation, UAS Tech. Scries No. 25 p 98 to 101.

60. Santhanakrishnan, P. and G. Oblisami. 1980. The response of maize and sorghum to *Azotobacter* inoculants, Aspects of Biological Nitrogen Fixation UAS Tech. Series No. 28 p 95-97.

61. Santhanakrishnan, P. and G. Oblisami. 1980. Multiplication of *Azolla Azolla-a biofertilizer*. Tamil Nadu Agrl University Coimbatore pp 22-26.

62. Santhanakrishnan, P. and G. Oblisami. 1980. Effect of bacterial inoculants and growth regulators on the growth of mulberry cuttings. Abst. National Symp. Sericultural Science TNAU Coimbatore p 31.

63. Santhanakrishnan; P., P. Vaidyhyanathan and G. Oblisami. 1980. Effect of *Rhizobium* strains on Leuceena seedlings Abst. National Symp. Biol. Nitrogen Fixation in Relation to Crop Production TNAU, Coimbatore p 9.

64. Santhanakrishnan, P., S.P. Sundaram and G Oblisami, 1980. Variablity in nodulation and nitrogenase activities in cowpea genotypes. Abst National Symp Biol Nitogen Fixation in Relation to Crop Production TNAU Coimbatore p 10.

65. Santhanakrishnan, P. and G. Oblisami. 1980. Evaluation of germplasm collection of amaranthus for nitrogenase activity in the rhizosphere. Abst. National Symp Biological Nitrogen Fixation in Relation to Crop Production, TNAU Coimbatore p 33.

66 Santhanakrishnan, P. and G. Oblisami. 1980. Effect of bluegreen algal inoculation on rice crop applied with different levels of nitrogen and phosphatic fertilizers. Abst. National Symp. Biol Nitrogen Fixation in Relation to Crop Production TNAU, Coimbatore p 45

67. Subbiah, P. and S. Ramiah. 1980. Studies on phosphorus and molybdenum nutrition with rhizobial inoculation in redgram. Paper Presented at the National Symposium on Biological N Fixation in Relation to Crop Production TNAU, Coimbatore, December 29-31, 1980.

68. Thangaraju, M. and S. Jayachandran. 1980 Certain physiological characteristics of antibiotic and pesticide resistant mutants of *Rhizobium* Alest. National Symp Biol Nitrogen Fixation in Relation to Crop Production TNAU, Coimbatore, p 55.

69. Udayasuriyan, V. and G. Oblisami. 1980. Response of Amaranthus species to Azopirilium inoculation under graded levels of fertilizer nitrogen National Symp Biol Nitrogen Fixation in relation to crap production, TNAU, Coimbatore p 26

70. Udayasuriyan, V. and G. Oblisami. 1980. Prevelance of *Azospirillum* in different parts of Amaranthus Alest National Symp Biol Nitrogen Fixation in Relation to Crop Production, TNAU, Coimbatore, p 75.

AGRICULTURAL NEMATOLOGY

1. Balasubramanian, P. and C. V. Sivakumar 1981. Evaluation of systemic insecticide-nematicides for the control of *Rotylenchulus reniformis* on betelvine. Paper Presented in Symposium of the Nematological Society of India held from 13-15th February 1981 at Tamil Nadu Agricultural University, Coimbatore-3.

2. Kandasamy, K. and C. V. Sivakumar. 1981. Effect of *Meloidogyne arenaria* on the germination of chilli (*Capsicum annuum* L.) seeds. Paper Presented in Symposium of the Nematological Society of India held from 13-15th Feb 1981 at Tamil Nadu Agricultural University, Coimbatore-3.

3. Kandasamy, K. and C. V. Sivakumar. 1981. Comparative biology of *Meloidogyne arenaria* and *M. incognita* on chilli (*Capsicum annuum* L.) Paper Presented in Symposium of the Nematological Society of India held from 13-15th Feb., 1981 at Tamil Nadu Agricultural University, Coimbatore-3.

4. Kumar, S. and C. V. Sivakumar. 1981. Seed treatment with nematicides and fungicides for the control of wilt complex involving *Rotylenchulus reniformis* and *Rhizoctonia solani* in okra. Paper Presented in the Symposium of Nematological Society of India held from 13-15th Feb, 1981 at Tamil Nadu Agricultural University, Coimbatore-3.

5. kumar, S. and C. V. Sivakumar. 1981. Disease complex involving *Rotylenchulus reniformis* and *Rhizoctonia* solani in okra. Paper Presented in the Symposium of Nematological Society of India held from 13-15th Feb., 1981 at Tamil Nadu Agricultural University, Coimbatore-1.

6. Lakshmanan, PL. and C. V. Sivakumar. 1981. Chemical control of root-knot nematode *Meloidogyne incognita* in tomato nursery Paper Presented in the Symposium of the Nematological Society of India held from 13-15th Feb., 1981 at Tamil Nadu Agricultural University, Coimbatore-3.

7. Lakshmanan, PL and C. V. Sivakumar. 1981. Control of *Rotylenchulus reniformis* in bhendi by integrated method. Paper Presented in the Symposium of the Nematological Society of India held from 13 15th Feb., 1981 at Tamil Nadu Agricultural University, Coimbatore.

8. Lakshmanan, PL., Sivakumar, C. V. and S. Palanisamy. 1981. Interaction of *Meloidogyne incognita* and *Rotylenchulus reniformis* on brinjal. Paper Presented in the Symposium of the Nematological Society of India held from 13 15th Feb., 1981 at Tamil Nadu Agricultural University, Coimbatore.

9. Palanisamy, S and P. Balasubramanian. 1981. Assessment of avoidable yield loss in cotton variety Suvin by fumigation with metham sodium. Paper Presented in the Symposium of the Nematological Society of India held from 13-15th Feb., 1981 at Tamil Nadu Agricultural University, Coimbatore.

10. Palanisamy, S. and P. Balasubramanian. 1981. Control of reniform nematode in cotton with non volatile nematicides. Paper Presented in the Symposium of the Nematological Society of India held from 13 15th Feb., 1981 at Tamil Nadu Agricultural University, Coimbatore.

11. Palanisamy, S. and P Balasubramanian. 1981. Control of *Hirschmanniella gracilis* through bare root dip with insecticides nematicides. Paper Presented in the Symposium of the Nematological Society of India held from 13 15th Feb, 1981 at Tamil Nadu Agricultural University, Coimbatore.

12 Palanisami, S. and C V. Sivakumar. 1981. Assessment of avoidable yield loss in cowpea, blackgram, maize and finger-millet due to *Rotylenchulus reniformis*. Paper Presented in the Syposium of the Nematological Society of India held from 13-15th Feb., 1981 at Tamil Nadu Agricultural University, Coimbatore

13. Ramakrishnan, C. and P. Balasubramanian. 1981. Control of *Meloidogyne incognita* in chilli nursery with nematicides Paper Presented in the Symposium of the Nematological Society of India held from 13-15th Feb, 1981 at Tamil Nadu Agricultural University, Coimbatore.

14 Sivagami Vadivelu and T S. Muthukrishnan. 1981. Iufluence of soil texture and moisture on *Pratylenchus delattrei* population. Paper Presented in the Symposium of the Nematological Society of India held from 13 15th Feb., 1981 at Tamil Nadu Agricultural University, Coimbatore

15. Sivagami Vadivelu and T. S. Muthukrishnan. 1981 Pathogenicity of *Pratylenchus delattrei* to crsssandra with special reference to biochemical alterations. Paper presented in the Symposium of the Nematological Society of India held from 13-15th Feb., 1981 at Tamil Nadu Agriculturel University, Coimbatore.

16. Sivakumar, C. V., and M. Mohanasundaram. 1981. Report on the occurrence of *Nothanguina phyllobia* in Tamilnadu and some observation on its biology. Paper Presented in the Symposium of the Nematological Society of India held from 13 15th Feb., 1981 at Tamil Nadu Agricultural University, Coimbatore.

AGRONOMY

1. Balasubramanian, R., A. Chamy and B. Syed Nazeer. Intercropping with pulses in summer Cambodia cotton. Paper Presented at the Seminar on Cotton, TNAU, Madurai, p. 153.

2. Balasubramanian, N. 1980. Influence of rainfall and total sunshine hours on the yield of cotton. Paper Presented at the National Seminar on Agroclimatology held at Coimbatore, July 28-29.

3. Chamy, A., Y. B. Morachan and A. K. Antony. 1980. Studies on the fibre qualities of ratoon cotton crop of CBS. 156. Paper Presented in Seminar on Cotton held on September 12th at TNAU, Madurai

4. Chandragiri, K. K. and S. P. Palaniappan, 1980. Sorghum ratoon cropping system for the south-west and north east monsoon seasons in Coimbatore region. Paper Presented at National Seminar on Agroclimatology held at Coimbatore - June 28-29, 1980.

5. Dasan, A. A. An analysis of rainfall at Kovilpatti, 1980. Paper Presented at the National Seminar on Agroclimatology. TNAU, Coimbatore, pp. 50-58.

6. Desan, A. A. *et al* Systems of planting and intercropping in rainfed cotton in Tamil Nadu, 1980. Paper Presented at the Seminar on Cotton, TNAU, pp 147-152.

7. Dasan, A. A. and Pothiraj. Moisture conservation methods for rainfed cotton 1980. Paper Presented at the Seminar on Cotton, TNAU, pp 31-35.

8. Iruthayaraj, M. R. and Y. B. Morachan. 1980. Calculation of evapotranspiration in rice. Madras agric. J. 67(7):436-440.

9. Iruthayaraj, M. R. and Y. B. Morachan, 1980. Effect of water management practices and nitrogen application on losses of nitrogen in low land rice. Madras agric. J. 67(8):502-505.

10. Iruthayaraj, M. R. and Y. B. Morachan, 1980. Effect of season, water management and nitrogen levels on the uptake by two rice varieties. Madras agric. J. 67(9):606-607.

11. Jayaraman, R and S. Ramiah. Response of cowpea (*Vigna sinensis* L) to phosphorus and growth regulator, 1981. Madras agric. J. (2);102-105.

12. Kandasamy, O. S. and S. Subramanian, 1980. Assessment of water requirement of sorghum on climatological basis. Paper Presented in National Seminar on Agroclimatology held at Coimbatore July 28-29.

13. Kandasamy, O. S., K. N. Chinnaswami and S. D. Peter. Rainfall pattern and crop planning for rainfed areas of Dharmapuri district, 1980. Paper Presented at the National Seminar on Agroclimablogy, TNAU, Coimbatore, July 28-29.

14. Kempuchetty, N. M. R. Iruthayaraj, Y. B. Morachan, and R. Kulandaivelu, 1980. Paper Presented at National Seminar on Agroclimatology at Coimbatore July 28 29.

15. Kempuchetty, N., M. R. Iruthayaraj, Y. B. Morachan and R. Kulandaivelu, 1980. Effect of solar radiation in rice varieties as affecting the cultivating periods at Coimbatore.

16. Kolandasamy, S. and S N M. Ramachandra Boopathy 1980 Economics of intercroping in irrigated cotton under Periyar Vaigai river command area. Paper Presented at Seminar Cotton held on September 12th at TNAU Madurai.

17. Krishnaswamy, S. and M.R. Iruthayaraj. 1980. Effect of chemical defoliants on seed cotton yield, fibre quality and earliness in MCU 9 cotton Paper Presented at Seminar on Cotton held on September 12th at TNAU, Madurai.

18. Krishnaswamy. S. and M. R. Iruthayaraj. 1980. Effect of plant density on MCU 9 Cotton. Paper Presented at Seminar on Cotton held on September.

19. Kulandaivelu, R., 1981. Weather at Tamil Nadu Agricultural University, Coimbatore. Madras agric J. 67(3):200 204.

20. Kulandaivelu, R., A. Balasubramanian, S. P. Palaniappan and Y B. Morachan, 1980 Weather at Tamil Nadu Agricultural University, Coimbatore in 1979. Madras agric J. 67(5):345-349.

21. Kulandaivelu, R., N. Kempuchetty and Y. B. Morachan, 1980 Rainfall pattern and cropping system in Coimbatore Madras. agric. J. 67(3):171-176.

22. Kulandaivelu, R. and N. Kempuchetty, 1980. An appraisal of weekly rainfall data at Coimbatore. Paper Presented at National Seminar on Agroclimatology held at Coimbatore, July 28-29.

23. Kulandaivelu, R , Y. B. Morachan and S. Sankaran, 1980. Effect of weather on growth and yield of groundnut. Paper Presented at National Seminar on Agroclimatology held at Coimbatore in July 28-29.

24 Kulandaivelu, R. R. Ragaswamy and Y. B. Morachan, 1980. A note on the spatial distribution of rainfall at Coimbatore. Madras agric J. 67(4):279-280.

25. Morachan, Y. B , 1980 Recent approaches in water management technology. Paper Presented at "Subject-Matter Training-cum-Disucssion Seminar on Water Management Technology held at Coimbatore. November 25-29

26. Morachan, Y. B , 1980. Problems and prospects of dryland farming. Paper Presented at "Subjected-Matter Training-cum-Discussion Seminar on Dry Farming Technology held at Coimbatore. December 2-6.

27. Muthukrishnan, P. and S. Subramanian, 1980. Path-coefficient study in maize. Madras agric. J 67(12).

28. Mylsamy, R. and M. R. Iruthayaraj, 1980. Effect of plant density and Nitrogen application on the uptake of major nutrients by cotton, Madras agric. J. 67(7):484-486.

29. Palaniappan, SP. 1980. Cropping systems in drylands. Paper Presented at Subject-Matter Training-cum-Discussion-Seminar on Dry Farming Technology held at Coimbatore - December 2-6.

30. Periyathambi, C. and S P. Palaniappan, 1981. Effect of premonsoon sowing, depth of seed placement, growth and yield components of rainfed sorghum. Madras agric. J. 68(2).

31. Purushothaman, S , B. Gururajan, S. D. Sundarsingh, V. Subbiah, S. Subramanian and K. P. Ramaswamy, 1980. Irrigation requirement of rice fallow crops in the Periyar Vaigai command area Paper Presented at Seminar on Cotton held on September at AC & RI, Madurai.

32. Purushothaman, S., and SP. Palaniappan, 1981. Rice based cropping system. Paper Presented at the Symposium on Recent Trials on Farming System in India held at Hissar, on March, 23-25.

33. Ramachandta Boopathi, S. N. M , S Kolandaswamy. and K. K. Subbiah. 1980 Effect of planofix under different levels of nitrogen and population on the yield of MCU. 8 cotton Paper Presented in Seminar on Cotton held on September 15th at TNAU, Madurai.

34. Ramadoss, G. and S. Subramanian, 1980 Influence of sowing time on the yield attributes and yield of rice varieties in Periyar Vaigai command area. Madras agric J. 67(6):375-378.

35. Ramdoss, G. and S. Subramanian, 1980 Influence of weather parameters on rice yield. Madras agric. J 66(9):608-609.

36. Ramarkrisihnan, M. S , 1980. Recent findings in rainfed farming for increased production. Paper Presented at Subject-Matter Training-cum-Discussion Seminar on Dryfarming Technology held at TNAU, Coimbatore from December 2-6.

37. Ramasamy, S., and S. Ramiah, 1980. Effect of foliar application of diammonium phosphate on growth and yield of Blackgram. Madras agric. J. 67(6):366-368.

38. Ramaswamy, S. and S Ramiah, 1980. A study on the method of sowing of rice fallow blackgram. Madras agric. J. 67(7):433-435.

39. Ramaswamy. S. and S. Ramiah, 1980. A comparative study of dibbling and broadcasting rice fallow blackgram (Vigna mungo) (L). Hepper Madras agric. J. 67(12).

40. Rangaswamy, R. and R. Kulandaivelu, 1980. A model for forecasting the rainfall. Paper Presented in National Seminar on Agroclimatology held at Coimbatore, July 28-29.

41. Sankaran, S. 1980. Efficient resource management in rainfed farming. Paper Presented at Subject-matter Training-cum-Discussion Seminar on Dry farming Technology held at TNAU, Coimbatore December 2 to 6.

42. Sankaran, S. 1980. Irrigation in relation to fertilization and weed management. Paper Presented at Subject-Matter Training-cum-Discussion Seminar on Water Management Technology held at Coimbatore November 25-29.

43. Selvaraj, K. V. and S. Subramanian. 1981. Pigeion pea (redgram)-Some aspects, Kisan World 8 (3) :51.

44. Selvaraj, K. V. and S. Subramanian. 1981. Influence of fertilizer and chemicals on the harvest and maturity of sorghum. Kisan World Vol 8(3):41.

45. Sivakumar, V. K., M. R. Iruthayaraj. and Y. B. Morachan, 1980 Effect of organic manures and dates of sowing in summer cotton (MCU 7). Madras agric. J. 67 (6) : 408-410.

46. Selvaraj, A. and M. R. Iruthayaraj. 1980. Effect of nitrogen inhibitors under different levels and time of application on seed cotton yield. Madras agric. J. 67. (12).

47. Subbiah, K. K. 1980. Effect of gradad doses of nitrogen and NAA on boll numbers and yield of MCU. 5 cotton. Paper Presented at Seminar on Cotton held on September 12th at TNAU, Madurai.

48. Subbiah, k. K. and Y, B. Morachan. 1980. Influence of temparature on uptake of NPK and Zn in rice. Paper Presented at National Seminar on Agroclimatology held at TNAU, Coimbatore, July 28-29.

49. Subbiah, k. K. and Y. B. Morachan. 1980. Yield forecasting of rice in relation to weather. Paper Presented at National Seminar on Agroclimatology on July 28-29, at TNAU, Coimbatore.

50. Subbiah, K. K. and Y. B. Morachan. 1981. Tiller production in rice as influenced by available nutrients Zn & Mn in the soil and their infer-relationship with yield. Paper Presented at National Seminar on Micronutrients in Agriculture held at TNAU, Coimbatore, January 7th to 8th.

51. Subbiah, K. K. and Y. B. Morachan. 1980. Influence of temperature on uptake of N, P K and Zn in rice. Paper Presented at National Seminar on Agroclimatology at Coimbatore - July 28-29.

52. Subbiah, K. K., S N. M. Ramachandra Boopathi. and S. Kolandasamy. 1980. Intercropping in banana. Madras agric. J. 67 (11) : 716-719.

53. Subbiah, P and S. Ramiah. 1981. Influence of phosphorus and molybdenum and rhizobial incoculation on phosphorus transfer efficiency in redglam. Madras agric. J. 69 (2).

54. Subramanian, S. 1980. Water stress as constraint to crop ptoduction Critical phases of water requirements Paper Presented at Subject-Matter Training-cum-Discussion Seminar on Water Management Technology held at Coimbatore Nov. 25-29.

55. Subramanian, S. 1980. Efficient use of water for rice. Paper Presented at Subject-Matter Training-cum-Discussion Seminar on Water Management Technology held at Coimbatore. November 25-29.

56. Subramanian, S. 1980. Water balence for Bhavanisagar. Paper Presented in National Seminar on Agroclimatology held July 28-29.

57. Subramanian, S. 1980. Efficient resoure management in rainfed farming. Paper Presented at Subject-Matter Training cum-Discussion Seminar on Dry Farming Technology held at TNAU, Coimbatore December 2 to 6.

58. Subramanian, P. S., S. Kolandasamy. and S. Subramanian. 1987. Path co-efficient study in maize. Madras agric. J. 69 (1).

59. Subramanian, P. S., S. Kolandasamy. and S. Subramanian. 1981. Effect of seasonal stress and nitrogen fertilization on protein content of grain in maize. Madras agric. J. 68 (2).

60. Subramanian, A and SP. Palaniappan. 1980. Effect of foliar fertilization of N&P on protein yield of blackgram varieties. Madras agric. J. 67 (12).

61. Subramanian, A. and SP. Palaniappan. 1981. Effect of method of planting plant density and phosphorus fertilization on yield of blackgram in irrigated system. Madras agric. J. 68 (2).

62. Subramanian, A. and P. Subramanian. 1980. Influence of phosphorus and method of its application on rice. Madras agric. C. 67 (6) : 411-412.

63. Subramanian, A. 1980. Critical studies on the rainfall pattern to evolve a cropping system in Natham region, Madurai district. Paper Presented at National Seminar on Agroclimatology held at TNAU, CBE on July 28th to 29th.

64. Sundar Singh, S.P. and S Subramanian. 1980. Cropping sequence studies undr different irrigation regimes for Periyar - Vaigai commandarea. Symposium on Recent Trends on Farming System in India held at Haryana Agrl University, Hissar March 23td to 25th.

65. Sundar Singh, S. P., B. Gururajan., S. Subramanian., S. Purusothaman., K. P. Ramaswamy. and V. Subbiah. 1980. Efficiency of mulches in reduction of irrigated requirement of cotton. Paper Presented at Seminar on Cotton held on September 12th at AC & RI, Madurai.

66. Syed Nazeen, B., A. Chamy. and A. Subramanian. 1980. Chemical weed control in irrigated cotton of summer tracts of Tamil Nadu. Paper Presented at the Seminar on Cotton, TNAU, Madurai, pp. 128-136.

67. Veerabadran, V., N. Gopalswamy., O. S. Kandaswamy. and K. K. Subbiah. 1980, A note on spacing and manurial requirement of sugarcane (Co 6304) at Madurai. Madras agric. J. 67 (8) : 542-543.

CROP PHYSIOLOGY

1. Gopalakrishnan, S., Vinodini Vasudevan, S.A. Kader, Kamala Thirumalaiswamy, K.P. Vijayan and G. Velu. Physiological variability in species and varieties of groundnut. Paper presented at the National Seminar on the Application of Genetics, TNAU, July 16-17, 1980.

2. Gopalakrishnan, S., J. Radhakrishnan and Kamala Thirumalaiswamy. Flower production and pod development. Paper Presented at the National Seminar on the Application of Genetics to Improvement of Groundnut, School of Genetics, TNAU, Jvly 16-17, 1980.

3. Gopalakrishnan, S., K.B, Anandakrishnan and Kamala Thirumaliswamy. Seed dormancy problems in groundnut. Paper presented at the National Seminar on the Application of Genetics to Improvement of Groundnut, School of Genetics, TNAU, Coimbatore, July 16 17, 1980.

4. Gopalakrishnan, S and Kamala Thirumalaiswamy. Effect of seed smear of cobalt on assimilate partition in groundnut varieties. Paper presented at the National Seminar on Micronutrients in Agriculture organised by TNAU, during January 7 and 8, 1981.

5. Moosa Sheriff, M , Y. Usha Rani and S. Gopalakrishnan. Forage chlorosis-A preliminary study. Paper presented at the National Seminar on Micronutrients in Agriculture, organised by TNAU, during January 7 and 8, 1981.

6. Sakharam Rao, J. and M. Thangaraj. Physiology of Cotton *in* Monograph on Cotton. TNAU, Coimbatore. pp 123-133. 1980.

7. Thangaraj, M. and S. Gopalakrishnan. Micronutrient status as influenced by genotypic variation and their inter-relationship under the incidence of "Reddening" in cotton. Paper presented in National Seminar on Micronutrients in Agriculture organised by TNAU, during January 7 and 8, 1981.

FOOD TECHNOLOGY

1. Manimegalai, G. and S. Neelekantan. Post-harvest processing and utilisation of tapioca. Proceedings of the National Seminar on Tuber Crop Production Technology, TNAU, Coimbatore, November, 1980, p 102.

2. Neelakantan, S. and G. Manimegalai. Post-harvest deterioration and storage of cassava tuber. Proceedings of the National Seminar on Tuber Crop Production Technology, TNAU, Coimbatore, November 21-22, 1980, p 97.

FORESTRY

1. Krishnaswami, S., V.M. Srinivasan, and R.S. Vinaya Rai. Growth increment and genetic variablity in relation to age in saplings of *Eucalyptus tereticorins*. Paper presented at the National Seminar on Tree Improvement, KFSC., TNAU, Trichy: Jan. 1981.

2. Stephen Dorairaj, M. and S. Kondas. Study on the structure of reparian casuarina Proceedings of the National Seminar on Tree Improvement, Kumaraperumal Farm Science Centre: January 8, 1981, pp 59-67.

3. Stephen Dorairaj, M. Correlation studies between biomas yield and its components in *Casuarina equisetifolia*. Ibid. 68-79.

4. Stephen Dorairaj, M. and I. Wilson. Effect of sex on growth and vigour in *Casuarina equisetifolia*. Ibid 72-78.

5. Vinaya Rai, R.S., V.M. Srinivasan, and S. Krishnaswami and A. Rangaswami. Studies on optimum nursery medium and use of graded seeds in *Eucalyptus tereticornis*. *South Indian Hort.* 28: 143-46 1980.

PLANT PATHOLOGY

1. Ayyavoo, R. and R. Samiyappan. 1981 Chemical control of betelvine will disease. Paper presented at the Group Discussion on Improvement of Betelvine Cultivation, NBRI, Lucknow.

2. Balasubramanian, K. Sivaprakasam, J.G. Robinson and N.M. Ramaswamy. Varietal resistance of pearl millet *Pennisetum typhides* (Brom, Stess and Hubb) to the shoot fly and ergot disease 1980. Pestology 4(2):16-18.

3. Shanmugham, N., A. Venkatrao and R. Samiyappan. Studies of phytopthera will of betelvine in Tamil Nadu - a review 1981. Paper presented at the Group Discussion on Improvement of Betelvine Cultivation, NBRI, Lucknow.

SEED TECHNOLOGY

1. Katheresan, M. and K.R. Ramaswamy 1980. Effect of time of sowing on the quality of sunflower seeds. *Madras agric* J. 67(9):591-593.

2. Senthil Kumar Kalinkarayar, A. and Dharmalingam, 1980. Influence of seed size on seed quality of sorghum, *Madras agric*. J. 67(7):453-461.

3. Thiagarajan, C.P. and K.R. Ramaswamy, 1979. Studies on maturation in two short duration cotton varieties viz. MCU 7 and PRS 72. Seed Res. 7 (1):1-4.

4. Thiagarajan, C.P. and K.R. Ramasamy 1979 Seed maturation in 'MCU 4' and 'MCU 8' varieties of upland cotton *Indian J. agric. Sci*. 49(11):844-50.

5. Veeraragavatatham, S., K.K. Vadivelu and T.B. Ranganathan, 1980. Seed vigour in CO 2 Papaya *South Indian Hort*. 28(3):69-71.

6. Velumani, N.P. and K.R. Ramaswamy, Studies on fruit development and maturation in *Abelmoschus esculentus* L. Moench. Indian *J. Hort*. 37(3): 283-285.

SOIL SCIENCE AND AGRICULTURAL CHEMISTRY

1. Arunachalam, G. 1980. Boi-fertilizers for the rice culture. In Proceedings of the State Level Training Programme on rice production Technology, Agrl. College & Res. Instt, Madurai, June, 1980. p. 56-60.

2. Arunachalam, G. 1980. Application of Azolla for rice production. In Azolla - a Bio-Fertilizer-Published Tamil Nadu Agricultural University, P. 33-39.

3. Balasundaram, C. S. and U. S. Sree Ramulu, 1980. Rationalising fertilizer rates for sorghum. I Screening of suitable soil test methods. Turrialba 30 (4) : 381-383.

4. Balasundaram, C. S., and U. S. Sree Ramulu, 1980. Rationalising fertilizer rates for sorghum. I Optimising the dose with relevence to the soil test values. Turrialba 30 (4) : 385-389.

5. Balasundaram, C. S., V. Velu and A. Subramanian, 1980. Effect of fertilization on the leaf nutrient concentration in some cotton cultivars. National Seminar on Cotton, Tamil Nadu Agricultural University held on 12th September 1980 P. 89-95.

6. Balasundaram, C. S , V. Velu and A. Subramanian. 1980. A Study on the relationship between foliar analysis and yield of cotton. National Seminar on Cotton. Tamil Nadu Agricultural University, held on 12th September 1980. P. 96-101.

7. Balasundaram, C. S , C. Paulraj and V. Velu, 1981. Studies on the method of zinc application in rice. National Seminar on Micronutrients in Agri. Tamil Nadu Agrl. University, held on 7-8te January 1981. P. 82-85.

8. Balasundaram, C. S., V. Velu and C. Pulraj, 1981. Zinc fertilization in rice. National Seminar on Micronutrients in Agri, Tamil Nadu Agrl. University. held on 7-8th January, 1981. P. 99-102.

9. Balasundaram, C. S., V. Velu and R. K. Ramkumar. 1981. Effect of fertilizer application on the yield of irrigated summer combodia cotton. Cotton Development 10 (3&4) : 6-8.

10. Boopathy, M. 1981. Avallability of zinc as influenced by chemical factors, National Seminar on Micronutrients in Agri. Tamil Nadu Agrl. University, held on 7-8th January, 1981.

11. Chandramani, R., K. K Krishnamoorthy, S. Ramanathan and M. Shanmugam. 1981. Influence of phosphorus and iron on dry matter and grain yield of rice grown in a typical haplustaif. National Seminar on Micronutrients in Agri. Tamil Nadu Agrl. University, held on 7-8th January 1981. P. 103-112.

12. Chandramohan, N., M. S. Venugopal, B. Habeebullah and M. Balasubramanian 1980. Evaluation of certain synthetic chemicals against betelvine scale. Entomology 5 (3) : 168 165.

13. Chellamuthu, S and G. V. Kothandaraman. 1980. Effect of farmyard manure and ammonium sulphate on the yield of ragi (*Eleusine coracana G*) Mysore J. Agric. Sci. 14 : 224-296.

14. Devarajan, R, M. Moosa Sheriff. G. Ramanathan and G. Selvakumari. 1980. Effect of P and Zn fertilization on yield, content and its uptake by pulse crops. Indian J. Agric Res. 14 (1) : 47-52.

15. Devarajan, R., G. Ramanathan, K. Shanmugam and V. Ravikumar. 1980. Note on effect of organic manure on uptake of micronutrients by sorghum CSH 5. Madras agric. J. 67 (2) : 128.130.

16. Devarajan, R., M. Moosa Sheriff and G. Ramanathan. 1980. Zinc content of ragi straw as infuenced by zinc fertilisation. Madras agric J. 67 (4) : 276-278.

17. Devarajan, R , G. Ramanathan and Rm. Panchanathan, 1981. Response of sunflower EC 58415 to the application of micronutrients. National Seminar on Micronutrients in Agri. Tamil Nadu Agrl. University held on 7-8th January 1981 P. 291-295.

18. Devarajan, R., C. K. Rajagopal and G. Ramanathan. 1981. Effect of organic matter on the availability of copper in soils. National Seminar on Micronutrients in Agri. Tamil Nadu Agrl. Univesity held on 7-8th January 1981. P. 329.

19. Devarajan R., R. Nagarajan and G. Ramanathan 1981. Response of wheat varieties (Safed lerma & N. P. 200) to the application of zinc sulphate. National Seminar on Micronutrients in Agri. Tamil Nadu Agrl. University. held on 7-8th January 1981. P. 330

20. Duraisamy, P, and R. Arumugam. 1980. Preliminary studies on the rooting of geranium cuttings as affected by soil reaction. Indian Perfumer. 24 (3): 168-169.

21. Dhakshinamoorthy, M., R. Arumugam and A. K. Mani 1980. Effect of copper and molybdenurn on the herboge yield and oil of geranium. (*Pelargonium graveolens*). Indian perfumer 24 (3): 214-215.

22. Gopalswamy, A. 1980 Decomposition of added organic matter. Symposium on Soil Organic Matter and Soil Fertility 1979-80.

23. Gopalswamy. A. 1980. Manuring of banana. Seminar on Planting Crops and Manuring. May 1980.

24. Gopalswamy, A. 1980. Effect of Azotobacter and grain yield and uptake of nutrients in cumbu. State Level Workshop on Microbial Inoculants. 1979-80.

25. Gopalswamy, A. 1980. Relationship between different forms of Mn in soils of Tamil Nadu. National Seminar on Micronutrients in Agri. Tamil Nadu Agrl. University. held on 7-8th January 1981.

26. Indira Raja, M. and D. Raj 1979. Effect of press mud application on physical, chemical and biological characteristics.

27. Indira Raja. M. and D. Raj 1980. A note on the influence of press mud application on ragi yield in an alkali soil. Madras agric. J 67 (3):204-206.

28. Kandaswamy, P. 1979. Influence of texture on certain soil moisture constants. Madras agric J. 66:276-299.

29. Kothandaraman, G V. and R Krishnaswamy 1980. Effect of nitrogen application on the quality of sorghum grain. Madras agric. J. 67 342 344.

30. Kothandaraman, G V. and R. Krishnaswamy, 1979. Influence of nitrogen on the yield and quality of ragi (*Eleusine coracana G*) straw. Madras agric. J. 66: 612-613

31. Loganathan, S ond C. R. Lakshminarasimhan. 1979. Properties of soil and yield of groundnut as influenced by application of amendments to soils. Madras agric. J 66 : 687-682.

32. Loganathan, S. and K. K. Krishnamoorthy. 1979. A study of calcium in relation to other cations in soils. Andhra agric J. 26 : 13-17.

33. Loganathan, S. and V. S. Krishnamoorthy. 1981. Boron application to bunch groundnut under irrigated and rainfed croppings. National Seminar on Micronutrients in Agri. Tamil Nadu Agrl. University, neld on 7-8th January 1981. P. 264.

34. Mani S. and K. M. Ramanathan. 1980. Effect of nitrogen and potassium on the yield of bhendi fruits. South Indian Hort. 28 (4) 136-138.

35. Mani S. and K. M. Ramanathan, 1981. Effect of nitrogen and potassium on the crude fibre content of bhendi fruits at successive stages of pickings. South Indian Hort. 29. 100-103.

36. Manickam, T. S., and P. Muthuvel 1980. Response of sunflower to phosphorus and potassium applications. Seminar on Responses of Crops to Application of P and K and Soil Fertility Evaluation. Tamil Nadu Agri. University 1980.

37. Manickam, T.S. and P. Muthuvel. 1981. A note on the influence of zinc on sunflower yield. National Seminar on Micronutrients in Agri. Tamil Nadu Agri. University, held on 7-8th January 1981 P. 221-222.

38. Manickam, T.S. and P. Muthuvel, 1981. Influence of zinc and boron on sunflower. National seminar on Micronutrients in Agri. Tamil Nadu Agrl. University, held on 7-8th January 1981. P 334.

39. Muthuswamy, P., M. Govindaswamy and P. Chandra Sekaran. 1980. Infl. uence of growth on the chemical composition of lucerne (*Medicago sativa* L) varieties. Forages Res. 6(1):63-69.

40. Muthuswamy, P. and K. Chiranjivi Rao, 1980. Influence of nitrogen and potash fertilization on tuber yield and starch production in cassava varieties. National Seminar on Tuber Crops Production Technology, Tamil Nadu Agrl. University held on 21-22 November 1980. P. 64 66.

41. Muthuswamy, P., M. Govindaswamy, A. Gopal, M. Balasubramanian and K.K. Krishnamoorthy 1980. Periodical nutrient removal and crude protein yield in the monthly cuttings of luceme (*Medicago sativa* L.) varieties J. Indian Soc-Soil Science 28 (3) : 405 406.

42 Muthuswamy. P., and M. Govindaswamy 1980. Tapioca (*Manihot esculenta* C.) leaf protein. Cheiron 9 (6) 357 359.

43. Muthuswamy, P., M Govindaswamy, P. Chandrasekaran and A. Gopal. 1980. Nitrogen and phosphorus uptake by Napier x Bajra hybird. Forage Res. 6 (2) : 201-207.

44. Muthuvel, P. and K. K Krishnamoorthy 1980. Influence of moisture and added N or P availability. Madras agric J 67 (4) : 242-247.

45. Muthuvel, P., P. Kandaswamy and K. K. Krishnamoorthy 1979. soil ph, EC and C. E. C. under long lerm fertilization. Madras agric. J. 66 : 296-299.

46. Nagasundaram, N. 1981. Relative merits of iron determination in corn leves by colorimetric method and atomic absorption spectroscopy for production of iron deficiency. National seminar on Micronutrients in Agri. Tamil Nadu Agril. University, held on 7-8th January 1981.

47. Nagarajan, R., G. Ramanathan and R. Devarajan 1981 Delineation of regions for micronutrient deficiency for southern States. National Seminar on Micronutrients in Agri. Tamil Nadu Agrl. University, held on 7-8th January 1981. P. 329.

48. Paulraj, C., and RaniPerumal 1980. Effect of sources and split application of N on nutrients uptake by tomato. Madras agric J. 67 : 106-108

49. Rajamannar, A , K.K. Krishnamoorthy and P.P. Ramaswami. 1980. Fertility status of plantation crops and manuring of plantation crops. P. 45-49.

50. Rajukkannu. K., M. Dakshinamoorthy, R. Arumugam and P. Duraiswamny. 1981. Seasonal influence on the total glycoside content of fox-glove (*Digitalis lanata*) Journal of Agricultural Science 96 (1) : 255.

51 Ramanathan, K. M. and K. Nemeth. 1980 EUF-K 25 a measure of K availability index for Tamil Nadu soils (India) Proc. Int. Symposium on the Application of Electro-ultra Filteraction in the Agrl. Production held at Budapest Hungary during 6-10 May, 1980 Vol II p. 291 307.

52. Ramanathan, K.M., Honara J. Francis, S. Subbiah and K.K. Krishnamoorthy 1980. Fixation of major plant nutrients by a black soil of Coimbatore dt. Madras agric J. 67:68-70.

53. Ramanathan, K.M., and K.K. Krishnamoorthy. 1980. A simple and repid method for determining available K status of rice soils. IL Riso(2):93-98.

54. Ramanthan, K.M. Honara J. Francis, S. Subbiah, K. Appavu and C.K. Rajagopal 1980. Influence of N and K on the yield and quality of cassava. Prod. National Seminar on Tuber Crop Production Technology Tamil Nadu Agrl. University held on 21-22 November, 1980 p. 66-71.

55. Ramanathan, K M. 1980. Maladies and remedies of soil. Paper presented in the Workshop on Land and Water Resources for Development held at Ruhsa during 25-28th November, 1980.

56. Ramaswami, P.P. 1979. Economic recycling of crop residues for soil fertility improvement Madras agric J. 66 : 737-743.

57. Ramaswami, P.P. K. Andi and K.K. Krishnamoorthy. 1979. Utilzation of rice straw for enhancing Azotobacter papulation in rice soil. Food Farming Agric 11 : 47-49.

58. Ravikumar, V., and K.K. Krishnamoorthly 1980. Influence of soil amendments on the physical properties of black soil and yield of ragi. Madras agric J. 67 : 177-182.

59. Ravikumar, V., and T.M. Thyagarajan. 1980. Soil physical problems in Coimbatore dt. Madras agric J. 67 : 248-51.

60. Ravikumar, V., and K.K. Krishnamoorthly 1980. Effect of soil amendments on the chemical properties of vertisol and yield of finger millet. Madras agric J. 67 : 368-379.

61. Singaram, P., and T. S. Manickam, 1980. Influence of some pesticides on the availability of nutrients to brinjal. Madras agric J. 67 24-27.

62. Subbiah, S., Honara J. Francis and K.M. Ramanathan. 1980. A note on the effect of triacontanal on the protein content, nutrient uptake and yield of rice. Madras agric J. 67 : 265-267.

63. Subbiah, S., and G V. Kothandaraman 1980. Effect of neem cake blending of urea on ammonium and nitrate N content in soils under field conditions. J. Indian Soc. Soil sd. 28 : 136-137.

64. Subbiah, S., and U.S. Sree Ramulu, 1980. The effect of anaerobically digested sewage sludge on organic fractions of sandy loam soil. Mysore J. agric sci. 14 : 301-304.

65. Subbiah, S., and U.S. Sree Ramulu 1980. Influence of sewage wastes addition on soil characteristics ii) Micronutrient contents in soils and uptake by sorghum (CSH 5). Madras agric J. 67 : 576-583.

66. Subbiah, K., J. Helkiah and C.K. Rajagopal 1980. Effect of N, P and K on capsaicin content of MDU 1 chilli. South Indian Hort. 28 : 103-104.

67. Subramanian S., and C.R. Venkataraman, 1979. Effect of neem seed crush treated urea on nitrogen uptake and yield of rice (IR 20) Madras agric J. 66 : 701-703.

68. Subramanian, T.L. U.S. Sree Ramulu. A. Rajarajan S. Ramanathan and C.P. Natarajan 1980. A study on rooting pattern of bengal gram (*Cicer arietinum 2*) using tracer techniques. Madras agric J. 67 : 51-53.

69. Surendran. R., P. Kandaswamy and A. Rajarajan 1981. Studies on the influence of cobalt on groundnut yield, oil content and protein. National Seminar on Micronutrients in Agri. Tamil Nadu Agrl. University held on 7-8th January 1981. P. 216-220.

70. Thygagarajan N.M., 1980. Note on the response of cotton to zinc sulphate. Paper presented at the Seminar on Cotton held at Madurai 1980.

71. Thyagarajan N.M. 1980. Response of Co 1 Blackgram to phosphorus fertilizer in black soils of Kovilpatti.

72. Vasudeven. P., 1980. Residues of Phasolone, Quinalphos, methyl parathion and fenitrothion on tomato. Indian J. Plant Protection VII (1) 14-22.

73. Vasudevan P., 1980. Carbofuran in rice pest control. Paper presented at the Seminar on Pest Management in Rice at Tamil Nadu Agrl. University Coimbatore on October 30-31, 1980.

74. Vasudevan. P., 1980. Residues of certain newer insecticides in brinjal pesticides XXIV (ii) : 15-17.

75. Velu. V., and C.S. Balasundaram. 1980. Effect of P and K fertilization in combination with N on the yield and uptake of nutrients in cotton National Seminar on Cotton Tamil Nadu Agri. University held on 12th September 1980 P. 75-82.

76. Venugopal, M.S., M. Balasubramaniam., K. Soundrarajan and B. Habeebullah 1980. Insecticicle residues in grapes. Pesticide residues in the environment in India. Proceedings of a Symposium held in November 1978 at Bangalore PP. 286-289.

77. Venugopal M.S., B. Habeebullah and M. Balasubramaniam. 1980. Residues of insecticides in and on tomato. Pesticide Residuce in the Environment in India. Proceedings of a Symposium held in November 1978 at Bangalore PP. 258-260.

HORTICULTURE

1. Anbazhagan, A. and K. G. Shanmugavelu. 1980. A new technique for repid multiplication of banana suckers. *Food Farming and Agriculture* XII (7) : 168-169.

2. Anbazhagan, A., W. Charles Vijayakumar and K.G. Shanmugavelu. 1981. Studies on the effect of 2, 4 - Dichlore phenoxy acetic acid (2, 4 - D) on certain banana cultivars. *National Sym. on Trop. and Sub-trop. Fruit Crops*, Bangalore. January 1981.

3. Arumugam, R. and C.R. Muthukrishnan. 1979. Association of resistance to yellow vein mesaic with economic characters. *Indian J. Agric. Sci.* 49 (8) : 605 8.

4. Arumugam, R. and C.R. Muthukrishnan. 1979. Gene effects of some quantitative characters in Okra. *Indian J. Agric. Sci.* 49(8) : 602-4.

5. Arumugam, R. and C.R. Muthukrishnan. 1979. Genetics of yield components in Okra. *Indian J. Hort.* 36 (3) : 283-88.

6. Arumugam, R. and Kumar, N. 1979. Geranium cultivation in Kodaikanal Hills. *Indian Perfumer* 23 (2) : 128-30.

7. Arumugam, R. and C.R. Muthukrishnan. 1979 Evaluation of cabbage varieties for Kodaikanal Hills. *Madras agric. J.* 66 (9) : 608-11.

8. Arumugam, R., S. Natarajan and H. Ahmed Shah. 1979. Effect of thinning in plums. *Madras agric. J.* 66 (7) : 482-83.

9. Arumugam, R., S. Natarajan and S. Sambandamurthy. 1979. Studies on the evaluation of carrot varieties for summer season at Kodaikanal. 1979. *South Indian Hort.* 27 : 35-40.

10. Arumugam, R and C.R. Muthukrishnan. 1981. Association of metric traits in bhendi. *South Indian Hort.* 29 (1) : 1-3.

11. Arumugam, R. and N. Kumar. 1980. Effect of leaves on rooting of stem cuttings of Bergamot-mint (*Mentha citrata Elch*) *Indian Perfumer* 24 (3) 166-67.

12. Asok Kumar, A and K.G. Shanmugavelu, 1981. Studies on the effect of foliar spray of urea on banana CV. Robusta. *National Sym. on Trop. and Sub-trop. Fruit Crops.* Bangalore. January, 1981.

13. Azhakiamanavalan, R.S. and V.N. Madhava Rao. A comparative study of hybrid 135 and Virupakshi bananas. 1980. *National Seminar on Banana Production Technology* TNAU, Coimbatore.

14. Azhakiamanavalan, R S. and J.B.M.Md. Abdul Khader. 1981. Studies on the effect of certain fertilizer treatments on tree vigour, fruit yield and quality of Lucknow 46 Guva *National Sym. on Trop. and Sub-trop. Fruit Crops,* Bangalore. January, 1981.

15. Balashanmugam, P V., Seemanthini Ramadas, P. Rajendran, D. Veeraragavathatham and B. Sampathkumar. 189. Genetic variablity and correlation studies in tapioca (*Manihot esculenta* Crantz) *National Seminar on Tuber Crop Production Technology.* Coimbatore, November, 1981.

16. Bhakthavatsalu, C.M., S. Sathiamoorthi and V.N. Madhava Rao. Bunchy top:the phenomenon of latency, partial recoxery and mild chronic infection. *National Seminar on Banana Production Technology,* Coimbatore. 1980.

17. Dharmaraj, G. and S. Subramaniam,. 1980. Effect of mulching on acid lime (*Citrus aurantifolia*), *Seminar on Diseases and Manuring of Plantation Crops.* Madurai. July, 1980.

18. Dharmaraj, G., S. Subramanian and M. Nagarajan, 1980. Micronutrient deficiency and their correction in mandarin. *Seminar on Diseases and Manuring of Plantation Crops.* Madurai. July, 1980.

19. Dhakshinamurthy, M., R. Arumugam and P.S. Srinivasan and P. Doraiswamy. 1979. Nutrient uptake studies on geranim. *Indian Perfumer* 23 (3): 220-21.

20. Dakshinamurthy, M., R. Arumugam and A.K. Mani, 1980. Effect of copper and molybdenum on the herbage yield and oil of geranium *(Pelargonium graveolens.* L' Herit) Indian Perfumer 24 (3):214-15.

21. Duraiswamy, P. and R. Arumugam, 1980. Preliminary studies on the rooting of geranium cuttings as affected by soil reaction. *Indian Perfumer* 24 (3):168-169.

22. Irulappan, I. and E. Vadivel. 1980. Hill banana the past, present and future. *National Seminar on Banana Production Technology* Coimbatore. 1980.

23. Krishnan, B.M. and K G Shanmugauelu, 1979. Studies on Water requirements of banana CV. 'Robusta'. Effect on morphological characters, crop duration, yield and quality of fruits. *Mysore J. agric. Sci.* 13:433-41.

24. Krishnan, B M. and K.G. Shanmugavelu, 1980. Studies on water requirements of banana CV Robusta. Total consumption use and water use efficiency. *Mysore J. agric. Sci.* 14:27-31.

25. Krishnan, B M. and K.G. Shanmugavelu, 1980. Studies on water requirements of Banana CV. Robusta. Leaf nutrient concentration and total uptake of nutrients. *Mysore J. agric. Sci.* 14:215-223.

26. Krishnaswami, S., V.M. Srinivasan and R.S. Vinaya Rai. 1981. Growth increment and genetic variability in relation to age in saplings of *Eucalyptus tereticornis*. *National Seminar on Tree Improvement*, Trichy Jan. 1981.

27. Krishnaswami, S.R. Vinaya Rai and V.M. Srinivasan. 1981. Genetic parameters and *inter se* correlation of morpho-physiological attributes in seven species of *Eucalyptus*. *silv. Genet.*

28. Kulasekaran, M., E. Vadivel and K M.P. Nambisan, 1981. Nitrogen and potassium requirements of pine apple *(Ananas comosus)*. *Seminar on Disease and Manuring of Plantation Crops*. Madurai May, 1980.

29. Kumar, N., R. Arumugam, S. Samandamurthi and O.S. Kandaswamy, 1980. Effect of growth regulatars on rooting of geranium (*Pelargonium graveolens* L' Heritt). *Indian Perfumer* 24 (1):36-39.

30. Kumar, N., R. Arumugam, S. Sambandamurthi and O.S. Kandasmami, 1980. A note on rooting of bergamot mint. *Indian Perfumer* 24 (1);31-35.

31. Kumar, N., R Arumugam, O.S. Kandaswamy and S. Natarajan, 1979. Estimation of optimum plot size and shape for field experiments in geraninm. *Madras agric. J.* 66 (12):826-28.

32. Kumar, N. and R. Arumugam, 1980. Effect of growth regulators on rooting of Rose mary *Rosemarianus officinalis* L.) *Indian Perfumer* 24 (4): 210-213.

33. Manimegalai, G. and S. Neelakantan. 1980. Post-harvest processing and utilization of tapioca. *Proc. National Seminar on Tuber Crops Production Technology*. TNAU, Coimbatore. November 1980. p 102.

34. Mohandas, S., R. Arumugam and P.S. Srinivasan. 1980. Efficiency of foliar application of nitrogen on foliage and oil yield in geranium. *Indian Perfumer* 24 (4):216-18.

35. Mohammed Mustaffa, M., C.R. Muthukrishnan and N. Ramaswamy, 1980. Effect of ethrel on the maturity and quality of sweet potato. *Seminar on Tuber Crops Production Technology*. Nov. 1980. Coimbatore.

36. Md. Abdul Khader, J.B.M., D. Veeraragavathatham, C.M. Pappiah and V. Palaniswamy 1980. Studies on the effect of improved cultural practices on cashew. *Seminar on Diseases and Manuring of Plantation Crops*. *Madurai*, May. 1980.

37. Muthukrishnan, C.R., C.M. Bhakthavatsalu, J.B.M.Md. Abdul Khader and S. Sathiamooothy Banana research : Major achievements and major issues for the future. 1980. *National Seminar on Banana Production Technology*. TNAU, Coimbatore.

38. Muthukrishnan, C.R. 1980. Tuber crop research in Tamil Nadu A resume. *Proc. National Seminar on Tuber Crops Production Technology*. Nov. 1980. TNAU, Coimbatore. p 1-8.

39. Muthukrishnan, C.R., K.G. Shanmugavelu, R. Subbiah and I. Irulappan, 1981. Genetic variability and correlation studies in winged bean. (*Psophocarpus tetragoualobus* DC.L). *Second Interntional Seminar on Winged Beans*, Sri Lanka. Jan. 21-23. 1981.

40. Muthuswany, S., T. Thangaraj and K. Nanjan, 1980. A study of rainfed cropping of peas. (*Pisum sativam* L.) in Shevroy Hills. *South Indian Hort*. 28 (2):63.

41. Muthuswamy, S., T. Thangaraj, Peter, G.B. Vedamuthu and K. Nanjan, 1980. Performance of french bean varieties (*Phaseolus vulgaris* L.) in Shevroys Hills under rainfed conditions. *South Indian Hort*. 28 (3):89.

42. Muthuswamy, S. and V. N. Madhava Rao. 1980. Heat resistance and flowering in jasmines. *National Seminar on Production Technology of Commercial Flower Crops*. Coimbatore Aug. 1980.

43. Muthuswamy, S. and V. N. Madhava Rao. 1980. The concept of relative temperature disparity in the flowering of *Jasminum* species. *National Seminar on Production Technology of Commercial Flower Crops*. Coimbatore. Aug. 1980.

44. Muthuswamy, S. and V. N. Madhava Rao. 1980. Effect of pinching of shoots in jasmines. *National Seminar on Ploduction Technology of Commercial Flower Crops*. Coimbatore. Aug. 1980.

45. Muthuswamy, S. and S. Sayed. 1981. Preliminary note on the extraction of lemon grass oil. *Indian Perfumer*, 24 : 226-227.

46. Nambisan, K.M.P. and B.M. Krishnan. 1980. Interspecies grafting in jasminum. *National Seminar on Production Technology for Commercial Flower Crops*. TNAU. Aug. 1980.

47. Nambisan, K. M. P. and B. M. Krishnan, D. Veeraragavathatham and N. Ramasamy. 1980. Induced mutants in jasmine (*Jasminum gradiflorum* L.) leaf spot resistant and dwarf mutants. *Science and Culture* 46 (12) : 427-428

48. Nambisan, K.M.P. and V N. Madhava Rao The influence of specific origin on leaf production and associated growth characters in South Indian banana. *National Seminar on Banana Production Technology*. TNAU. 1980.

49. Nambisan, K.M.P. and V.N. Madhava Rao. 1980. The influence of specific origion on the chlorophyll and protein contents of leaf lamina in South Indian banana clones. *National Seminar on Banana Production Technology*. TNAU, 1980.

50. Nambisan, K. M. P., B. M. Krishnan, M. Selvarajan and L. R. Kajasekaran. 1980. Manuring of bananas. *National Seminar on Banana Production Technology*. TNAU, 1980.

51. Nanjan, K., S. Muthuswamy and T. Thangaraj. 1980. Pine apple-A paying crop for Shevroy Hills. *Indian Hort*. 25 (3) : 23.

52. Nanjan, K. and K. G. Shanmugavelu. 1980. Flower bud initiation, differentiation and development in Edward rose (*Rosa bourboniana*. Desp.) *Indian Perfumer* XXIV (3) : 153 - 162.

53. Nanjan, K., K.M.P. Nambisan, D. Veeraraghavathatham and B. M. Krishnan. 1980. The effect of nitrogen, phosphorus and potash on the yield of tube rose. *National Seminar on Production Technology of Commercial Flower Crops*. Coimbatore. Aug. 1980.

54. Nanjan, K., K.M.P. Nambisan, B. M. Krishnan, D. Veeraragavathatham, D. Paulas, N. Ramaswamy and J. B. M. Md. Abdul Khader. 1980. The nitrogen fertilization of two clones of banana under Periyar Command area of Madurai District. *National Seminar on Banana Production Technology*. TNAU, Coimbatore.

55. Nanjan, K., S. Muthuswamy and G. Balakrishnamoorthy. 1980. The havoc caused by phanerogamic parasite *Loranthus longiflorus* on mandarin. *Seminar on Diseases and Manuring of Plantation Crops*. Madurai. May, 1980.

56. Nanjan, K., S. Muthuswamy and M. Shanmugam. 1980. Control of sooty mould in Mandarin (*Citrus reticulata* Blance). *Seminar on Diseases and Manuring of Plantation Crops*. Madurai, May 1980.

57. Natarajan, S. and R. Arumugam 1979. Studies on variability in french beans. *(Phaseolus vulgaris L.) Madras agric. J* 66 (2) : 89 93.

58. Natarajan, S. and R Arumugam. 1980. Correlation and path co-efficient analysis in peas *(Pisum sativum* L.) *Madras agric. J.* 67 (6) : 387-90.

59. Natarajan, S. and R Arumugam 1980. Analysis of character association in cabbage (*Brassica oleracea* var. capitata) *South Indian Hort.* 28 (4) : 116-18.

60. Natarajan, T., P. Santhanakrishnan S. Thamburaj, K. G. Shanmugavelu and G. Olisami 1980. Effect of 'zero tillage' and organic mulches on the microflora of soil grown to tapioca. *Proc. National Seminar on Tuber Crops Production Technology*. Nov. 1980. TNAU, Coimbatore.

61. Neelakantan, S. and G. Manimegalai. 1980. Post harvest deterioration and storage of cassava tuber. *Proc. National Seminar on Tuber Crops Production Technology*. TNAU, Coimbatore. Nov. 1980. p. 97.

62. Neelakantan, S. 1980 Sorghum gram chemistry nutritive value, processing and utilisation. *Assn. Food Sci. Tech., Chapter Chronicle.* 4 (2) : 4.

63. Paulas. D. 1980. A new method of rapid multiplication of plants of *Jasminum sambac* Cv. Gundumali. *National Seminar on Production Technology for Commercial Flower Crops*. TNAU. Aug. 1980.

64. Premraj, S., K G. Shanmughavelu and S. Thamburaj. 1980. Studies on the effect of N and K on yield and quality of tubers in colocasia. *National Seminar on Tuber Crops Production Technology*. TNAU, Coimbatore Nov. 1980.

65. Ponnuswami, N., I. Irulappan, E. Vadivel, M. Kulasekaran and G. Dharmaraj. 1980. Performance of mandarin (*Citrus reticulata*) on different root stocks at Lower Pulney Condition. *National Symposium on Tropical and Sub-Tropical Fruit Crops*. Bangalore. Jan. 1981.

66. Ragupathi, A. and M. Kulasekaran. 1980. Studies on the possibility of bunchy top disease containment on Palani Hills through vector control. *National Seminar on Banana Production Technology*. Coimbatore, July 1980.

67. Rajendran, G., T. G. Naganathan and Sivagami Vadivelu. 1979. Studies on banana nematodes. *Indian J. Nematol.* 9 (1) : 54.

68. Rajendran, G. and T. G. Naganathan 1979. Nematicidal control of *Rotylenchulus reniformis* in grape variety Anab-e-shahi. *Indian J. Nematal*. 9 (1) : 87.

69. Rajukkannu, K , M. Dakshnamurthi, R. Arumugam and P Duraiswamy. Seasonal influence on the total glycoside content of fox-glove *(Digitalis lanata) J. Agric. Science* 96 (1) : 255.

70. Ramadoss, R , R. Vaithialingam and C. M Bhakthavatsalu. Control of weeds in banana with the aid of herbicides. *National Seminar on Banana Production Technology*. TNAU, Coimbatore July, 1980.

71. Rajendran, G., C. M. Bhakthavatsalu, V. N. Madhava Rao and J. B. M. Md. Abdual Khader, 1980. Studies on the occurrence and distribution of nematodes in banana in Tamil Nadu. *National Seminar on Banana Production Technology*. TNAU, Coimbatore. July, 1980.

72. Rajasekaran, L. R. and K. G. Shanmugavelu. 1980. Effect of salt stress on seed germination of tomato. *South Indian Hort*. 28 (4) : 109-112.

73. Rajasekaran, L. R. and K. G. Shanmugavelu. 1980. A note on salt-tolerance of different varieties of tomato (*Lycopersicum esculentum* L.) at germination. *Curr. Sci*. 9 : 138-139

74. Rajasekaran, L. R. and K. G. Shanmugavelu, 1981. Studies on screening of certain vegetable crops for salt tolerance *South Indian Hort*. 29: (1) : 38-48.

75. Ramaswamy, N. and C. R. Muthukrishnan 1980. Nutritional requirements of certain cultivars of tapioca. National seminar on Tuber crops Production Technology, TNAU, Coimbatore Nov. 1980.

76. Ramasamy, N., C. R. Muthukrishnan and K. G. Shanmugavelu. Varietal performance of Mishrikant *(Pachirluzus erosus)* Ibid

77. Ramaswamy, N., K. G. Shanmugavelu and M. Vijayakumar. 1980. Effect of different depths of planting in cassava *Ibid*.

78. Rengaswamy, P. and K. G. Shanmugavelu. 1980. Variability studies in radish. *(Raphanus sativus*. L.) *South Indian Hort*. 28 (3) : 77-81.

79. Sampath, G., K. G. Shanmugavelu and S. Thamburaj. 1980 Studies on the quality of tubers from single budded and normal setts of tapioca. *Ibid*.

80. Sampath, G., K. G. Shanmugavelu and S. Thamburaj, 1980. Effect of sett size and method of raising on growth and yield of tapioca. National seminar on Tubber crops Production Technology. TNAU, Coimbatore. Nov. 1980.

81. Sampathkumar, D., K. G Shanmugavelu and S. Shamburaj, 1980. Studies on growth and development of sweet potato. *Ibid.*

82. Sathiamoorthy, S., C. M. Bhakthavatsalu and I. B. M. Md. Abdul Khader. 1980. Problems in banana production. National Seminar on production Technology, TNAU, Coimbatore. 1980.

83. Sathiamoorthy, S. and V. N. Madhava Rao 1980 Pollen production in relation to genome and ploidy of some banana cultivars. *Ibid.*

84. Seshadri, K., K. Mohamed Usman and C. Parambaramani 1980 Control of post-harvest decay of 'Robusta' banana with an emulsified mineral oil *Ibid.*

85. Selvaraj, P. and K G. Shanmugavelu, 1981. Studies on the major and micronutrient levels of bearing and non-bearing grapevines. *National Symp. on Trop. Sub. Trop. Fruit Crops*, Bangalore Jan. 1981.

86. Seemanthini Ramadas and D. Veeraragavathatham. 1980 Performance of certain Cashew clones under Vriddhachalam conditions. *Cashew causerie* II (4) : 10-11.

87. Shanmugam, N., C. Thalamuthu and R Jeyarajan. Observation of the phenomenon of tristeza resistance in preimmunised acid lime seedlings. Paper presented at the National Seminar on Disease Resistance in Crop Plants, TNAU, Coimbatore, 1980.

88. Shanmugavelu, K. G and M. Vijayakumar, 1980. A preliminary study on the system of planting *Colocassia esculenta* Schott. National Seminar on Tuber Crops Production Technology, TNAU, Coimbatore. Nov. 1980.

89. Shanmugavelu, K. G., C R. Muthukrishnan, R. Subbiah and P. Rajendran, 1981. Studies on the perfomance of certain varieties of winged bean (*Psophocarous tetraoonaioba* DC.L.) Second International Seminar on Winged beans. Srilanka. Jan 1981.

90. Shanmugavelu, K. G. and R. Balakrishnan. 1880. Growth and development in banana. National Seminar on Banana Production Technology, TNAU, Coimbatore July 1980. p. 67-72.

91. Sivaprakasam, K., S. Thamburaj and N Ramasamy. 1980. Varietal reactions to leaf spot. National Seminar on Tuber Crop Production Technology, TNAU, Coimbatore Nov. 1980.

92. Srinivasan, V. M., R. S. Vinayarai and S. Krishnaswami, 1981. Studies on nursery techniques in *Eucalyptus tereticornis* 1. Optimal seed rate and container size. *South Indian Hort.*

93. Subramanian, R. and K. G. Shanmugavelu, 1980. Flower bud initiation and differentiation in *Jasminum grandiflorum. Indian J. Hort.* 37(2):188-191.

94. Subramanian, K. S., A. Ragupathy and T. K. Kandaswamy, 1980. Prospect of containing bunchy top disease of banana. *Seminar on Diseases and Manuring of Plantation Crops.* Madurai, May 1980.

95. Subramanian, K. S. and A. Ragupathy, 1980. Studies on the combined use of insecticide, and weedicides in Banana Bunchy top disease management programme. *Ibid.*

96. Suthanthirapandian, I. R., M. Elangovan and P. Rengasamy. Association of metrictraits in chillies (Capsicum annum L). South Indian Hort. 29 (1) : 70-71, 1980.

97. Thalamuthu, C., N. Shanmugam and R. S. Azhakiamanavalan. Studies on the disease resistance behaviour in some fruit crops at Periyakulam 1980. Paper presented at the Seminar on Disease Resistance in Crop plants, TNAU, Coimbatore.

98. Thamburaj, S., A. Shanmugasubramaniam and P. Gnanamurthy 1980. Correlation studies in snake ground (*Trichosanthus anquina.* L). *South Indian Hort.* 26 (3): 157-68.

99. Thamburaj, S., O. Anchanam Alagia Pillai, S. Anbu and K. G. Shanmugavelu 1980. Preliminary studies on the perfoımance of certain varieties of cauliflower *(Brassica oleracea.* var. botryts) South Indian Hort. 28 (3): 82-84.

100. Thamburaj, S., R. Jayabal, A. Shanmugasubramanian and O. Anchanam Alagiapillai, 1980. Correlation studies in fruit characters of guava. *(Psidium guajavu* L. cv. Lucknow. 46) South Indian Hort. 28 (2): 58-59.

101. Thamburaj, S., K. G. Shanmugavelu, P. Chockalingam and O. Anchanam Alagia Pillai, 1980. Varietal evaluation in bush beans (*Phaseolus vulgaris. L*) South Indian Hort. 28 (4) : 113-115.

102. Thamburaj, S., N Ramaswamy, C. R. Muthukrishnan and K G. Shanmugavelu 1980. A short duration variety CO 2 Sweet potato *South Indian Hort.* 28 (1): 26-27.

103. Thamburaj, S., R. Jayabal and O. Anchanam Alagia Pillai, 1980. Studies on growth and development of fruit in cashew (*Anacardium occidentale.* Linn). *South Indian Hort.* 28 (1): 26-27.

104. Thamburaj, S. and C. R. Muthukrishnan, 1980. Induced mutations in tapioca. Proc. National Seminar on Tuber Crops Production Technology. TNAU, Coimbatore Nov. 1980. p. 35-38.

105. Thamburaj, S., K.G. Shanmugavelu, C.R. Muthukrishnan and M. Vijayakumar 1980. Studies on no tillage in tapioca. *Ibid.* p. 39-42.

106. Thamburaj, S. and K. G. Shanmugavelu, 1980. Studies on method of plan ting single budded setts of tapioca. *Ibid.* p. 47-48.

107. Thamburaj, S., A. Shanmugasubramaniam, M. Suresh and C.R. Muthukrishnan 1980. Studies on optimum plot size and shape for field experiments in tapioca. *Manihot esculenta.* (Crantz) *Ibid.* p. 84-86.

108. Thamburaj, S. and C. R. Muthukrishnan, 1980. Studies on storage periods of tapioca stem *Manihot esculenta.* (Crantz) *Ibid.* p. 87-88.

109. Thamburaj, S. and S. Kuppuswamy, 1980. Varietal response to scales in tasioca. *Ibid.* p. 90-92

110. Thamburaj, S., A. Shanmugasubramaniam and M. Suresh. Genetic variability in sweet potato in two environments. *Ibid.* p. 116-118.

111. Thangaraj, T., S. Muthuswamy and K. Nanjan. 1980. Growing carrot (*Daticus carota.*) as a rainfed crop in Shevroy Hills. *South Indian Hort.* 29(1):74.

112. Thangaraj, T , R. Subbiah, V. Ponnuswamy and K. Nanjan. 1980. Preliminary observation on the varietal performance in *Arecanut* (*Areca catechu. L.* *South Indian Hort.* 28(4):151.

113. Thangaraj, T., S. Muthuswamy and K Nanjan, 1980. Performvnce of cabbage (*Brassica oleracea* var. capitata. L.) cultivars in Shevroy Hills. *South Indian Hort.* 28 (1): 12-13.

114. Vadivel, B., R. Arumugam and N. Kumar, 1980 Influence of row spacing on the yield and oil content of Bergamot mint (*Mentha citrata.* Ehrh) *Indian Perfumer.* 24 (4) : 207-209.

115 Vadivel, E., S. Annadurai and K.G. Shanmugavelu, 1980. Nucleic acids, protein and ascorbic acid during ontogeny of banana cultivars, Monthan and Robusta. Food Farming and Agriculture 12 (8):205-206.

116. Vinayarai, R.S., V.M. Srinivasan and S. Krishnaswamy, 1960. Genetic variability and correlation of physiological and morphological attributes in seedlings of Eucalyptus *IUFRO Symp.* Fast growing trees, Brazil. Aug. 1980.

117. Vinayarai, R.S., V.M. Srinivasan, S. Krishnaswamy and A. Rangaswamy. 1980. Studies on optimum nursery medium and use of graded seeds in *Eucalyptus tereticornis.* *South Indian Hort.* 28:143-146.

118. Vinaya Rai., B. Krishnaswamy and V.M. Srinivasan. 1981. Juvenile and adult performance of six species of Eucalyptus and selection index for seedling quality. *Natnl Seminar. Tree Improvement* KFSC. Trichy. Jan. 1981.

ANIMAL GENETICS

1. Bhuvanakumar, C.K. and P. Subramanian 1981. Effect of body weight on greasy fleece weight in Merino, Nilagiri and their crosses. *Cheiron.* 10:40-42.

2. Eswaran, B.M., U.S Krishnamurthy and V. Rathnasabapathy. 1980. Relationship of blood glutathione level with production traits in Meyer strain white leghorn layers. *Cheiron.* 9:285-290.

3. Krishnmurthy, U S., V. Mani and V. Thiagarajan, 1981 Note on growth of Soviet Merino, Nilagiri and their crossbred sheep. Indian. J. Anim. Sci. 51:236-238.

4. Krishnamurthy, U.S and V. Rathnasabapthy, 1980 Genetics of haemaglobin in Nilagiri, Merino and their crossbred sheep-Haemglobin types and their relationship with production and reproduction traits. Indian Vet. J 51: 654-659.

5. Ulaganathan, V., V.R. Kosalaraman and P. Rangareddy. 1980. Yie d of edible meat from broiler crossbreds at ten weeks of age. *Cheiron.* 9 153-157.

6. Ulaganathan, V., V.R. Kosalaraman and P. Rangareddy, 1980. Genetic effects influencing dressing percentage and yield of commercial cut up parts estimated from diallel mating system in broilers. Cheiron. 9:222-230.

7. Venkatasubramanian, S., K.F.R Sheriff, K. Gajendran, K. Sundaresan. P. Kumararaja and P. Kothandaraman, 1980. Effect of prolonged pre-incubation storage on the hatchability and mal positions in chicken eggs Kerala Journal of Veterinary Science. II:70-74.

ANIMAL NUTRITION

1. Kadirvel, R. 1980. The use of spent tea dust in a layer mash Cheiron 9: 135-137.

2. Gabriel Raj, A. and R. Kadirvel 1980. The nutritive value of cashew cake in a chick starter mash. Ind.J.Poultry Sci., 16:204-206.

3. Alfred Jayaprasad, P. Kothandaraman, R. Kadirvel and A.R. Krishnan, 1981. Influence of strain, housing and season on egg quality traits in white leghorn pullets. Cheiron 10:(2) 63-66.

4. Kalimuthu, S.K. and R. Kadirvel, 1981. Water quality and chick growth. Ind. J. Poultry Sci., 16:15-21.

CLINICS

1. Bindmadav Rao Clinical trials on the efficacy of Distodin against bovine paraamphistoniasis. Cheiron (1980) 9:(4) 258-259.

2. Bindmadav Rao, A and T M. Thangaraj Hepato Cerebral intoxication in a dog-a case report Cheiron (1980) 9:(4) 304-306.

3. Neduncheralathan, B., A.T. Peter, A.R. Krishnan, S.A. Quayam. Note on Estroprogynon treatment for metostral bleeding and its influence on conception Ind. J. Anim. Sci. 61(3 360-361: 1981.

4. Neduncheralathan, B. and AT. Peter. On the treatment of captive tigers. Liv. Adv. M (1) 27 (1981).

5. Neduncheralathan, B and A. R. Krishnan. Prostagladins in reproduction College Annual Vol. 36:37 (1980)

6. Neduncheralathan, B. Progesleron treatment for lactoonal anoestrus, Paper Presented at the Platinum Jubilee Celebration Scientific Seminar,

7. Narashiman, K.S., T.M. Thangaraj, A.R. Krishnan, B. Neduncheralathan. Hysterectomy in a sow - Cheiron: 1980 9:5 302-303.

8. Narashiman, K.S., B. Neduncheralathan, D. John. Induction of parturition in *Bubalus, bubalis* Ind. Vet. J. 58:79-80 (1981).

9. Parthasarathy, G. and M S. Ganapathy. Serum protern pattern in canines by paper electro phorosis. Cheiron (1980) 9:(4) 231-233.

10. Parthasarathy, G. Emergency in vet practice. Live. Adv. (1980) V:34.

DAIRY SCIENCE

1. Jayachandran, T., P.S. Krishnamurthi, V. Ramasamy and R. Narasimhan. 1980 A preliminary study on the usefulness of barn tests as screening tests for the diagnosis of subclinical mastitis.

2. Sadasivam, R. Manickam and V. Kathaperumal 1980. Studies on the dressing data in the hybrid broiler chicken. Poultry Adviser. 13(4)-65-66.

ANIMAL DISEASE INVESTIGATION AND CONTROL

1. Viswanathan, S., G.A. Rahamathulla Khan, P. Mahalingam, and S Damodaran, (1980). "Aqinquennial survey of poultry mortality" Cheiron 9:94-96.

2. Venkatesan, R.A. (1980) "Seasonal variation in the intensity of caprine demodecosis". Cheiron 9, 158-166.

3. Venkatesan, R.A. (1980) "Significance on the presence of Demodex caprae in the internal organs of goats Cheiron 9:15-21.

ANIMAL HUSBANDRY ECONOMICS

1. Prabaharan, R. and R.K. Patel, 1981. Factors affecting expenditure on milk and milk products *Cheiron* 10(1):21-23.

2. Patel, R.K. and R. Prabaharan, 1980. Consumer awareness and preference for milk in Madras City. Indian J. Marketing 11 (4)'13-16, 32.

3. Rangarajan, G., C. Ramasamy, and V. Pugazhendi, 1980. Milk production with crossbred cows. A micro-analysis. *J. Agric. Econ.*35 (4):161-162.

LAB. ANIMAL MEDICINE

1. Srinivasan, R,, A.M. Shanmugam and S. Nedunchelliyan 1981. "A note on the control of ulcerative entritis in quails. Cheiron 1981 10:1:49-52.

MEATS

1. Ramayan, G.N , Ramamurthi, E.S. Venkatesan and C.V. Govindarajan 1980. Dressing percentage and proportion of certain edible and inedible offals in relation to slaughter weight in rabbits. Cheiron 9 p. 319-324.

MICROBIOLOGY AND BIOCHEMISTRY

1. Dorairajan, N. and V.D. Padmanaban, 1980. "Conglutinin and immune conglutinin in dogs in health and disease". Cheiron 10 (1):33-39.

2. Dorairajan, N. and V.D. Padmanaban, 1980. "Conglutinin and immunoconglutinin in canines *Paper Presented at the Annual Conference of Indian Immunology Society, Madurai 9-12th December.*

3. Gnanabaranam, J.F., V.D. Padmanaban, M.S. Jayaraman, K. Nachimuthu, and R.A. Balaprakasam, 1980. Diagnosis of rinderpest by blocking measles haemaglutination inhibition antibody with infected lymphnodes. Indian Vet. J. 57 (10):792-795.

4. Jayaraman, M.S., V.D. Padmanaban, P.R. Massillamony and K. Nachimuthu, 1980. Serological studies of sinus neoplasms among bovines in Tamil Nadu. Cheiron. 9 (2):89-92.

5. Palaniswamy, K.S , A.T. Venugopalan, and U.K. Menon. Studies on the growth of new cattle disease virus (F strain) on sheep kindney monolayer. Cheiron 10 (2):58-62.

6. Sadasivam, S. R. Kasthuri and S. Subramaniam, 1980. Nutritional survey in a village of Tamil Nadu. Indian J. Nutr. Dietet. 17 : 245-250.

7. Thayumanavan, B. 1980. Nitrogen, fixation by the fungus, *Pleurotus sajor-caju* (Fr.) Singer. Indian. J Bioch. Biophy. 17 : 75-77.

8. Thayumanavan, B. and A. Manickam, 1980. Protein quality of the sporephore of the fungus *Pleurotus sajor-caju* Indian J Nutr. Dietet 17 : 140-142.

OBSTETRICS AND GYNAECOLOGY

1. John, D. and K. S. Narasimshan, 1980 A case of Amorphus glubosus in a she goat. Cheiron. 2 : 129-139.

2. John, D. and K. S. Narasimhan, 1980. A case of Schistosomus reflexes in a cow. *Cheiron* 4 : 256-257.

3. John, D. and K. S Narasimhan, 1980. Partial percutaneous foetotomy in a case of entrotransverse presentation in a she buffalo. Cheiron. 6 : 348-349.

4. John, D. and K. S. Narasimhan, 1980. Partial subcutaneous embryotomy in a she goat. Cheiron. 3 : 197-197.

5. John, D. and K. S. Narasimhan, 1980. The surface area of the mediastinum testis of buffalo bull. Cheiron. 6 : 360-362.

6. John, D. and K. S. Narasimhan, 1980. A successful preparation of teaser ram by lateral transplantaion of sheath. Kerala Journal of Veterinary Science. 2 : 262-265.

7. Narasimhan, K. S., T M. Thangaraj, A. R. Krishnan, and B. Neduncheralathan, 1880. Hysterectomy in a sow. *Cheiron.* 5 : 304-306.

8. Narasimhan, K. S., A. R Krishnan, V. N. Seshagiri and D. John, 1980. Biochemical properties of cervice-vaginal mucous in buffaloes *Cheiron* 3 : 176-178.

9. Narasimhan, K. S., B Neduncheralathan, D. John and J. Rajasekaran, 1981. Induction of Parturition in *Bubalus bubalis*. *Indian Vet. J.* 58 : 79-80.

10. Pattabiraman, S. R. and R. K Pandit, 1980. Studies on haematological and biochemical constituents in blood of buffaloes with uterine torsion. *Cheiron* 6 : 338-330.

11. Venkataswami, V., and S. R. Pattabiraman, 1981 Recent advances in reproduction. The Journal of the Remount and Veterinary Corps 4 : 183-187.

PARASITOLOGY

1. Achuthan, H. N., S. Mahadevan and C. M. Lalitha, 1980. Observations on the transmission of *Babesia bigemina and B. Canis Cheiron* 9 : 131-133.

2. Achuthan, H. N., S. Mahadevan and C M. Lalitha, 1980. Studies on the developmental forms of *Babesia bigemina and Babesia canis* in Ixodid ticks. Indian Vet J. 57 : 181-184.

3. Ebnezer Raja, E. 1980. "Some observations on the mode of multiplication of *Theileria annulata* in the bovine host". *Paper Presented at Australasian Seminar on Haemoprotozoan Diseases conducted at the Harayana Agricultural University Hissar*

4. Joseph, S. A. and K. R Mani, 1980. *Cervus unicolor Niger*, the Indian Sambar, a new host for *Ancistropsylla nepalenis* leuris 1968 Cheiron, 9 : 198-199.

5. Joseph, S. A. and S. Kandasamy, 1980 On the occurence of the guinea worm, *Dracunculus medinesis* (Linnaeus 1758) Gallandant 1773 in an Alsation dog Cheiron, 9 : 363-36 .

6. Joseph, S A. 1980. Studies on the anthropophilic habits of *Cetenocephalides felis orientis* (Abstract) *Indian J Parasit.* 3 : 90.

7. Joseph, S. A. 1980. "Studies on the Anthropophisic habits of *Cetenocephalides felis*". *Paper Presented at the III National Congress of Parasitology held at Haryana Agricultural University, Hissar.*

8. Koshy, T. J., G. Rajavelu and C. M. Lalitha, 1980. "Life cycle patterns in Argasid ticks". *Paper Presented at the 3rd National Congress of Parasitology held at Haryana Agricultural University, Hissar.*

9. Lakshmanan, P. and S. A Joseph, 1980. The occurence of a mixed infection of *Toxacaris leonina* and *Ancylostoma caninum* on Indian lion *Pantaeralloo persica*. Cherion 9 : 198-199.

10. Lalitha, C. M. and R. Anandan, 1980. Guinea worm infection in dogs. *Cheiron* 9 : 198-199.

11. Mahadevan, S., H. N. Achuthan, M. S. Gopal and M. G. Richard. 1980. Splenectomy in calves and dogs in relation to babesiosis. Cheiron 9 : 205-207.

PATHOLOGY

1. Damodaran, S., M. Thanikachalam and P. V. Ramachandran, 1980. Genital and mammary tuberculosis in cows. *Cheiron* 9, 3, 187-192.

2. Nagarajan, V., R. Ramakrishnan, S. Damodaran and K. P. Chandrasekaran, 1910. Studies on bursa fabricius of chickens with special reference to its influecnce on growth and response to some infections. *Cheiron* 9, 5, 269-275.

3. Paikne, D. L., S. Damodaran and K P. Chandrasekaran, 1980. Cardiac lesions in Bovines. Cheiron 9, 5, 311.

4. Ramakrishnan, R. S., Viswanathan and M. Thanikachalam 1980. Genetial neoplasms of hens. Cheiron 9, 5, 311.

5. Ramakrishnan, R. 1980. Lipoma in a fish. Indian Vet. J 57. 501

6. Ramakrishnan, R. and B. Murali Manohar, 1980. Melanoma in domestic animals - A survey. *Indian Vet. J.* 57, 619-23.

7. Thilagarajan, N. 1980. A survey of bovine neoplasms in Madras State *Cheiron* 9, 6, 325-328.

8. Viswanathan, S., G. A R. Khan, P. Mahalingam and S. Damodaran, 1980. Quinquenial survey of poultry mortality. Cheiron 9, 2, 93-96. *Paper Presented at the Symposium on Tumours involving the Head in Domestic Animals. Kerala Agricultural University, Mannuthy.*

9. Viraraghavan, K.. P. Richard Masillamony, L. Kesavalu and R. Ramakrishnan, 1980 Survey of incidence of neoplasms of upper respiratory tract in Bovines in Tamil Nadu.

10. Richard Masillamony, P., K. Viraraghavan, L. Kesavalu and R. Ramakrishnan 1980. Exfoliative cytology in the diagnosis of neoplasms of upper respiratory tract of bovines.

PHARMACOLOGY

1. Ayyappan, P., R. Natarajan, M. S. Krishnamoorthy and V. M. Ramaswamy, 1980. "A study of cardiac toxicity of histamine cedilanid combination in dogs". Indian Vet. J. 57 (1) 31-34.

2. Gopalan, S., H. C. Samanna and V. M. Ramaswamy, 1980. "Certain haomatological studies on Zylazine in dogs". Cheiron 9 (1) 49-54.

3. Gopalan, S., L. N. Mathuram and R. Natarajan, 1981. "A preliminary report on the effects of Crotalaria juncea on reproduction". Cheiron 10 : 1 53-55.

4. Jayasundar, S. and M. M. Vohra, 1980. Recent studies on the actions of Cholinomimetic drugs on adrenergic nerves and their implications for cholinergic link hypothesis". Can. Jour. Phys and Pharm. 58 (1) 1-6

5. Mathuram, L. N. H C. Samanna, V. M. Ramaswamy and R. Natarajan, 1981 "Studies on the hypoglycaemic effects of Strychnos potatorum and Acacia arabica on alloxan diabetes in rabbits". Cheiron 10 : 1 2-5.

6. Sridharan, N. V., H. C. Samanna, V. M. Ramaswamy and R. Natarajan 1981. Studies on the effects of Hyrophila sponosa, Andhrographis panniculata, Liv. 52 and Kinel Forte in experimentally induced liver damage in dogs". Part. II. Cheiron 10 : 1 10-14.

PREVENTIVE MEDICINE

1. Abdul Khader, T.G. and M.C. John, 1980, Mexaform trials in dogs. Ind. Vet. J. 57. 422-425.

2. John, M.C. and T.G. Abdul Khader 1980. Leptospiral jaundice among buffaloes in Madras City. Indian Vet. J. 57. 681-683.

3. John, M.C. 1980. Some observations on bovine haematuria. Indian Vet. J, 1043-1046.

POULTRY SCIENCE

1. Alfred Jayaprasad, I, P. Kothandaraman, A.R. Krishnan and R. Kadirvel, 1981. Influence of strain, housing and season on egg quality traits in White Leghorn pullets. Cheiron 10 63-66.

2. Gajendran K, P. Dhanapala, V. Sundararasu, I. Alfred Jayaprasad. The effect of hatching egg sanitation on hatchability and chick growth of Rhode Island Reds. Indian J Poultry Sci. 15:16-21.

3. Gabriel Raj, A. and P. Kothandaraman, 1981. Economic utilization of fish meal in chick starter ration. Indian Poultry Rev. 12(14):13-14.

4. Gabriel Raj, A. and P. Kothandaraman, 1981. Supplementary effect of sesame oil cake in groundnut cake chicks starter ration. Indian Poultry Rev. 12(15):23-24.

5. Narahari, D., P. Rangareddy, V. Venkataramanujam and P. Kothandaraman, 1981. Poultry offal meal (POM). as a subsirtute for fish meal in broiler finisher diets. *Indian Poultry Rev.* 12 (12):17-20.

6. Narahari, D, F.R. Sheriff. P Ranga Reddy, S. Ayyamperumal, K. Vedha-nayagam and P. Kothandaraman, 1980. Preliminary studies on the energy and protein requirements of White Leghorn and New Hampshire chicks. Cheiron 9:291-296.

7. Narahari, D , K Venugopal, C.S Anandalakshimi and K. Vedhanayagam, 1980. A note on the chemical composition of commercially available rice polishings in Madras city. *Indian Poultry Rev.* 12(1):21-25.

8. Padmanaban. R., P. Kothandaraman, F.R. Sheriff, K. Viswanathan and P Dhanapalan, 1980. Effect of feeding sodium bicarbonate on egg shell quality, egg production and hatchability in White Leghorn birds. *Indian Poultry Rev.* 9(24):21-25.

9. Raj, K , P. Kothandaraman, R. Kadirvel and P. Ranga Reddy, 1980. The etfect of body weight at housing on the laying performance of White Leghorns. Cheiron 9:91-101.

10. Sheriff, F.R , Hamid Sheriff, K. Vedhanayagam, P. Dhanapalan and P. Kothandaraman, 1980. Pre-laying nutrition on performance of Rhode Island Red birds. *Indian Poultry Gaz.* 64:35-39.

11. Sheriff, F R., K. Sundaresan, B. Sethuraman, K. Vedhanayagam and A R Krishnan, 1980. Judging pullets for production on physical parameters. Indian Poultry Rev. 11(23):29-30.

12. Sheriff, F.R., K. Vedhanayagam, P. Kothandaraman, V. Venkataramanujam ahd K. Sundaresan, 1981. Performance of meat quality of White Leghorn male chicks on different dietary treatments. *Cheiron* 10:24-31.

13. Sheriff, F.R., K. Vedhanayagam, K. Viswanathan, A. Gabriel Raj. and P. Kothandaraman, 1980. Economy of raising egg type male chicks for meat Cheiron 9:276-280.

14. Venkatasubramaniam, S., F R. Sheriff, K. Gajentran, K. Sundaresan and P. Kothandaraman, 1980. Effect of prolonged pre-incubation storage on the hatchability and mal-position in chicken egg. *Kerala J. Vet. Sci.* 2: 70-74.

PHYSIOLOGY

1. Gopalakrishnan, L V. 1980. Studies on the effects of sodium fluoride on cardiac musculature.

2. Gopalakrishnan, L V. 1981. Studies on the effects of sodium fluoride on smooth and skeletal musculatures. Cheiron 10:6-9.

3. Govinda Rao, R., S. Venkatayan, V. Venkatasamy and P. Kothandaraman 1980. Performance of High plasma alkaline phosphatase (H.P.A.P). strain White Leghorn pullets. Cheiron 9:141-147.

4. Govinda Rao, R., S. Venkatayan and P. Kothandaraman 1980. Effect of age, sex and testoesterone on plasma alkaline phosphatase in poultry. Cheiron 9:69-74.

5. Govinda Rao, R., S. Venkatayan, V. Venkatasamy and P Kothandaraman, 1980. ''Plasma alkaline phosphatase isozyme type and their relationship to their levels and economic traits in poultry". Cheiron 9:4 238-244.

6. Govinda Rao, R., S.V. Venkatayan, R. Venkatesan and P. Kothandaraman, 1980. Correlation estimates for plasma alkaline phosphatase level at different ages to economic traits in Meyer Strain White Leghorn chicks.

7. Govinda Rao, R., R. Venkatesan, S. Venkatayan and P. Kothandaram, 1980. "Heritability estimates of plasma alkaline phosphatase activity and economic traits in Meyer strain white leghorn chicks,.. Cheiron 9:329-333.

8. Sankaranarayanan, S. and S. Venkatayan 1980. "In vivo studies on the influence of Thippi nitrogen utlisation from groundnut and gingelly oil cakes in the rumen of cattle". Indian Vet. J. 57;57-61.

9. Venkatayan, S., R. Thiagarajan, and D. Mangalraj, 1980. "Serum amylase level in normal dogs". Cheiron 9:317-318.

10. Viswanathan, S., R. Govinda Rao and S. Venkatayan, 1980. ''Haemaglobin variants and their relation to certain haematological indices in Fucesian and Jersey calves". Cheiron 9:334-337.

SURGERY

1. David, Godfrey and E.I. Rajendran 1980. The after effects of spaying in bitches and cats. Cheiron 9:193-195.

2. Dewan Muthu Mohamed, M.S. 1980. A radiographic report and observations on hydatidosis in cows and in a goat. Cheiron 9:33.

3. Mahadevan, S., H.N. Achuthan, M.S. Gopal and M.G. Richard 1980. Spleenectomy in calves and dogs in relation to Babesiosis. Cheiron 9:203.

POULTRY RESEACH STATION, NANDANAM

1. Ranga Reddy, P., K. Gajendran, R. Kumararaj and P.K. Thandaraman 1980. Influence of egg position during storage on hatchability. Cheiron Vol. IX No. 6:352-354:

2. Sneriff, F.R., K. Vedhanayagam, P. Kothandaraman, V. Venkataramanujam and K. Sundaresan 1981. Performance of meat quality of White Leghorn chicken on different dietary treatments. Cheiron 10:1, 24-31.

3. Sheriff, F.R., K. Vedhanayagam, K. Viswanathan, A. Gabriel and P. Kothandaraman 1980. Economy of raising egg-type male chicks for meat. Cheiron 9:5, 276-280.

4. Sheriff, F.R., K. Hamid Sheriff, K. Vedhanayagam, P. Dhanapal and P. Kotdandaraman 1980. Pre-laying nutrition on performaace of Rhode Island Red birds. Indian Poultry. Gaz. 64 (2) 35-39.

5. Ulaganathan, V., V.R. Kosalaraman and P. Ranga Reddy 1980. Yield of edible meat from broiler crossbreds at ten weeks of age Cheiron 9: 3 153-157.

6. Ulaganathan, V., V.R. Kosalaraman and P. Ranga Reddy 1980 Genetic effects influencing dressing percentage and yield of commercial cut up parts estimated·from diallel mating system in broilers. Cheiron 9:4-222-230.

7. Venkatasubramaniyam, S., F. R. Sheriff, K. Gajendren, K. Sundaresan and P. Kothandaramam 1980. Effect of prolonged pre-incubation storage on the hatchability and mal position in chicken eggs. Kerala Journal of Veterinary Science Vol. N. 1 p. 20-33.

LIVESTOCK RESEARCH STATION, KATTUPAKKAM

1. Ganesakale, D. (1980). Prevalence and prevention of sheep mortality". Paper Presented in All India Seminar on Pasture and Sheep Development held at Hosur.

2. Md. Habibullah Khan, M. Mahalinga Nainar, A. Kanagaraj, P. Natarajan, N. and Rajavelu, G. (1980). Persistency of milk yield in Murrah buffaloes. Cheiron 9 : 341-344.

SHEEP BREEDING RESEARCH STATION, SANDYNALLAH

1. Ammerjan, K., C. K. Bhuvanakumar and V. Mani 1980. Effect of age on greasy wool production of Merino and Nilagiri crossbred sheep. Indian Vet. J 57 : 244-246.

2. Krishnamoorthy, U. S., V. Mani and V. Thiagarajan, 1981. Note on growth of Soviet Merino, and their crossbred sheep. Indian J. Anim. Sci. 57 : 236-238.

3. Mani, V. and I. M. Rodricks. 1980. Production performance of Grozney Merino Sheep. Cheiron 9 : 264-268.

4. Raman, K.S., V. Mani and T. Sivaraman, 1981. Correction factors in Nilagiri and Merino sheep. Indian Vet. J. 58 : 145-149.

ANIMAL HUSBANDRY, COIMBATORE

1. Manickam, C. A. Gopalakrishnan, D. Jayaseelan Chellappa and M. Mookkappan, 1980. A note on acute balantidial dyscentry in pigs. Cheiron 9 : 6 345-347.

2. Natarajan, A., K. K. Krishnamoorthy and C. A. Gopalakrishnan. 1981. Evaluation of Hybrid Napier Grass NB 21 at different stages of growth for their digestibility by using the in vitro fermentation technique. Livestock Adviser, Vol. VI. 33-

FISHERY SCIENCE

1. Devarajan, S. and K. Rajendran, 1980. Institutional finance and agricultural development. Agricultural Banker, April-June '80.

2. Indra Jasmine, A., Jeyapragasam, M., V Rajukannu and Thenammai. Effect of Carbofuran on tissue ATPase and ocetylcholinesterase of rats.

3. Jameson, J. D. and P. Natarajan, 1980. Effects of food rationing on growth and conversion of cat fish, *Mystus punctatus*. Hydrobiologia. (communicated)

4. Jameson, J. D. and S. V. Job, 1981. Phytoplankton and detritus interrelationship in the feeding propensity of *Tilapia mossambica* held in fish pens. Hydrobiologia (communicated)

5. Jameson, J. D. and S. V. Job, 1980. Polyculture experiments in *Tilapia mossambica* and *Cyprinus carpio*. Proc. Symp. Coastal and Inland Fish Culture in Tamil Nadu - Fisheries College Tuticorin.

6. Jegatheesan, G. and V. K. Venugopalan, 1981. Total particulate organic matter in Vellar Estuary. Indian Journal of Marine Sciences, CSIR, New Delhi.

7. Jegatheesan, G. and V. K. Venugopalan, 1981. Distribution and seasonal variation of particulate organic carbon. Indian Journal of Marine Sciences, CSIR, New Delhi.

8. Jegatheesan, G. and V. K. Venugopalan, 1981. Distribution and seasonal variation of particulate aud dissolved carbohydrates. Indian Journal of Marine Sciences, CSIR, New Delhi.

9. Jegatheesan, G. and Venugopalan, V. K. 1981. Distribution and seasonal variation of plant pigments. Indian Journal of Marine Sciences, CSIR, New Delhi.

10. Joel, D. R., and P. J. Sanjeeviraj. Taxonomic remarks on the two species of Soylla (de Haan) Journ Inland Fish. Soc. of India, 1980.

11. Joel, D. R., Sanjeeviraj and P. Natarajan. The scope of coconut-cum-fish culture. Journ Inland Fish Soc. of India, 1980

12. Joel. D. R., and P. J. Senjeeviraj The breeding of some edible crabs of the Pulicat Lake. Paper Presented at the Symposium of some Invertebrate Breeding Zoology, Development, Madras University, July, 1981.

13. Joel, D. R. and P. J. Sanjeeviraj. Our food crabs. Sea-Food Export Journal, 1981.

14. Joseph, K. C. and P. Jeyachandran, 1980. Pelletised artificial feeds for fish culture. Seminar on Coastal and Inland Fish Culture, Fisheries College, Tuticorin.

15. Joseph, K. C. 1980. Processing technology for the B. F Sc. programme Seminar on Teaching Fisheries held at Fisheries College, Tuticorin, February, 1980.

16. Joseph. K. C., 1980 Chemistry for Fisheries Students. Seminar on Teaching Fisheries held at Fisheries College, Tuticorin, February, 1980.

17. Joseph, K. C. 1980. Fisheries Extension activities at the Fisheries College, Tuticorin. National Seminar on Fisheries Extension at Central Institute of Fishary Technology, Cochin December, 1980.

18. Natarajan, P., Shetty, H P. C. and K. V. Rajagopal, 1980. On certatn observations on parasites and diseases of fresh water prawn *Macrobrachium equidens* (Dana). Symposium on Coastal Aquaculture, Cochin. 12-16 February.

19. Natarajan, P. 1980. Aquaculture for fisheries students. Seminar on Teaching Fisheries held in Fisheries College, Tuticorin 22nd September, 1980.

20 Natarajan P., Ramanathan, N. and K. Venkataramanujam, 1980. Prospect of fish culture in Kanyakumari District. Seminar on Inland Fish Culture in Tamil Nadu, Fisheries College, Tuticorin 25 April, 1980

21. Natarajan, P., Ramanathan, N. and M. N. Kutty, 1980. Paddy-cum-fish culture in India and an appraisal of its feasibilities in Tamil Nadu. Ibid.

22. Natarajan, P. and N. Ramanathan, 1980. Role of fish pathology in aquaculture. Ibid.

23. Natarajan, P , Ramanathan, N. and K. Venkataramanujam, 1980. Fish seed resources of Tuticorin. Ibid.

24. Natarajan, P. and Sundararaj, 1980. A review of parasites and diseases of marine mussels Workshop on Mussel Farming held at Central Marine Fisheries Research Institute, Madras 25-27, September.

25. Natarajan, P. and N. Balakrishnan Nair. The nature of distribution and attachment of copepods parasitic on the gill, buccal and branchial cavity of fishes. J. Aqua. Biol.

26. Natarajan, P., Sridar, W. N. and A. L. Paul Pandian. Observations on the electrophoretic pattern of proteins of copepod parasites. Comp Physiol. Ecol.

27. Natarajan, P. A new species of *Arqulus* muller (Crustacea; Branchiure) with a note on the distribution of different species of *Arqulus* in India.

28. Natarajan, P., D. R. Joel, and G. Sanjeeviraj. Coconut-cum-fish culture. J. Inland. Fish. Soc. India.

29. Natarajan, P. and N. Balakrishnan Nair. The general and histopathology of copepod parasites of fishes. J. Aqu. Biol.

30. Natarajan, P. and V. Sundararaj. Freshwater prawn farming. Kissan World.

31. Natarajan, P., V. Ramadhas and N. Ramanathan, 1981. A case report on mass mortality of marine cat fish. Science and Culture.

32. Natarajan, P. and J.D. Jameson, 1981. Dietary protein conversion in different fish fingerlings. J. Fish. Biol.

33. Rajannan, G., R. Narayanan, Kandasamy and G. Oblisami 1980. Interaction between the pollutants of certain factories and growth of nitrogen fixing organisms and crop plants. National Symposium on Biological Nitrogen Fixation in Relation to Crop Production, Tamil Nadu Agricultural University, Coimbatore - December 1980.

34. Ramadhas, V., Sumitra Vijayaraghavan, 1980. Food conversion in the shrimp *Metapenaeus monoceros* (Fabricius) fed on mangrove leaves. Presented in the Symposium on Coastal Aquaculture, held at Cochin, India (1980) Abstract No 236.

35. Ramadhas, V., B. Loganathan and V.K. Venugopalan, 1980. Some experimental studies on BOD in estuarine water Presented in the First Indian Conference on Ecology and Evironmental Sciences, held at Jaipur during 18 to 20th of February '80. Abstract No. 96.

36. Ramadhas, V., B. Loganathan, and V.K. Venugopalan, 1980. Ibid. Abstract No. 103.

37. Ramadhas, V and Sumitra Vijayaraghavan, 1980. Conversion efficiency in the shrimp *Metapenaeus monoceros* fed on decomposed mangrove leaves. Indian Journal of Marine Science, (2):123

38. Ramadhas, V., S. Vijayaraghava, and Josep Royan, 1980. Biochemical charges and energy content of the mangrove *Rhizophora mucronata* leaves during decomposition. In. J. Mar. Science. a(2):120-123.

39. Ramadhas, V. and V. Sundararaj, 1980 Instant live food. Sea Food Export Journal XII, (a).

40. Ramanathan, N. and P. Natarajan, 1980. The flat fishes of Porto Novo (India) Pisces, Pleuronectiformes). Bull. Zool. Mus Univ. Amsterdam 9 (10):89-116.

41. Ramanathan, N., K. Venkataramnujam, and G. Sanjeeviraj, 1980. A redescription of Cirrhitichthys aprinus (C.F.V.) Cirrhitidae from Tuticorin. J. Mar. Biol. Ass. India (in press).

42. Ratnam Nadar, C. and M.N Kutty, 1980. Performance of B.F.Sc. students in the Trimester system of eduation, Teaching Seminar Book, Fisheries College, Tuticorin.

43. Ratnam Nadar, C. 1980. A study on village ecosyytem. Rural India. Oct-Nov. 1980. PB (12).

44. Ratnam Nadar, C., C.R Muthukrishnan, I. Irulappan, and A.S. Subramanyan, 1980. Variability studies in tomato. (Lycopersicum esculentomriet) South Indian Horticulture, 28. No. 4. October 123-127.

45. Ratnam Nadar, C., S. Varadarajan and C. Kailasam, 1981. A multivariable analysis of the determinants of the level of income on farms in village Madampatti, Coimbatore Taluk, Tamil Nadu (communicated).

46. Sanjeeviraj, G. and P. Natarajan, 1980. Prospects of freshwater prawn culture in Tamil Nadu. Ibid.

47. Santhanam, R., N Sukumaran and M N. Kutty. Survival of fishes and crustaceans of Tuticorin Bay to graded increase in temperature. Indian J. Mar. Sci. 9(4):296-297.

48. Santhanam, R., V Sundararaj and K. Krishnamurthy, 1980. 'Trophic Tier'- In contributions to Marine Science. Dr. C. V. Kurian's Birthday Commemoration volume (ed. G S. Sharma, A Mohandas and A. Antony, pp. 209-217.

49. Santhanam, R., N. Sukumaran, M.N Kutty and H M. Kasim, 1980 Thermal pollution of coastal waters and its effect on fish survival. Proc. Symp. Coastal Aquaculture (in press)

50. Santhanam, R., B. Srikrishnadhas, and M N. Kutty, 1980. Energy and nitrogen balance in rohu and common carp. Seminar on Coastal and Inland Fish Culture in Tamil Nadu

51. Santhanam, R., N Sukumaran and M.N. Kutty, 1980. Influence of ambient oxygen on food conversion efficiencies in mrigal fingerlings with the description of a constant oxygen level regulating device - Ibid.

52. Santhanam, R., N Sukumaran, and M.N. Kutty, 1980. Survival of *Sarotherodon mossambicus* in industrial effluents in relation to its biodegradation Indian J. Environ. Health. (accepted for publication)

53. Sridhar, P., G. Sanjeeviraj, and M N. Kutty A projection for brackish water prawn production in Tamil Nadu for the decade 1979-80. Ibid.

54. Srikrisanadhas, B. 1980: Effect of biocides on some culturable species of fresh and brackishwater fishes Seminar on Coastal and Inland Fish Culture in Tamil Nadu.

55. Srikrishnadhas, B., R. Santhanam and M.N. Kutty, 1980. Protein requirements of rohu and common carp. Ibid.

56. Sukumaran, N. and K. Venkataramanujam, 1980. Scope of composite fish culture in increasing fish production. Proc. Symp. Coastal and Inland Fish Culture in Tamil Nadu, Fisheries College, Tuticorin.

57. Sukumaran, N. and K Venkataramanujam, 1980. Potential for development of sewage fed fish culture in Tamil Nadu. Ibid.

58. Sukumaran, N., K Venkataramanujam, P. Sridhar, and M.N. Kutty, 1980. Demonstration of sewage fed fish culture in Madurai Municipal Sewage Farm. Ibid.

59. Sukumaran, N. and P Selvaraj, 1980. Production cost and profitability of pond-raised fish. Ibid.

60. Sukumaran, N., G. Sanjeeviraj, and M.N. Kutty, 1980. Prey vulnerability to predation by murrel *Channa striatus*. Ibid.

61. Sukumaran, N., K. Venkataramanujam, P. Natarajan and M.N. Kutty, 1980. Fish seed resources of Tamil Nadu, India, with a note on the destruction of immature fish and their conservation. Proc. International Symposium on Conservation Inputs from Life Science - Uuiversity Kebangsaan, Malaysia.

62. Sukumaran, N., K. Vasagan, M Shanthi and M,N. Kutty, 1980. Influence of mercuric compounds on the survival and swimming performance of freshwater fish, *Sarotherodon mossambicus*. Ibid.

63. Sukumaran, K., M.N. Kutty, and H.M. Qasim, 1980. Influence of temperature and salinity on survival of the freshwater mullet, *Rhinomugil corsula* (Hamilton). Aquaculture : 20 : 261-274.

64. Sukumaran N. and Samuel Paulraj, 1980. A note on the growth of stunted mrigal in polyculture system. Madras Agrl. Journal (in press)

65. Sukumaran, N., M N Kutty and K. Venkataramanujam, 1980. Growth of common carp hatchlings in demestic sewage. Indian J. Environ. Health (communicated)

66. Sukumaran, K , M. N. Kutty and M. Narayanan, 1980 Influence of hypoxia on the matabolism and survival of some Indian snakes. Proc National Acad. Sci. (accepted for publication)

67. Sukumaran, N and M.N. Kutty, 1980 pH regulation during long term swimming in freshwater mullet, *Rhinomugil corsula*. Proc. Indian Acad. Sci. (communicated).

68. Sukumaran, and Samuel Paulraj, 1980. Studies on certain hydrobiological changes in sewage - fed fish culture ponds. J. Madurai Kamaraj University (communicated).

69. Sukumaran, N and M.N. Kutty, 1980 Energy utilisation in fresh water mullet, *Rhinomugil corsula* (Hamilton) under exercise. Aquaculture (communicated).

70. Sukumaran, N., Samuel Paulraj and M. N. Kutty, 1980. Food conservation efficiency and optimum growth rate of grass carp (*Ctenopharyngodon idella* Valenciennes) fed with some seeds and grasses in composite fish culture system. Aquaculture (communicated).

71. Sukumaran, N , Ramadevi, K. ann M. N. Kutty, 1981. Influence of biocides on swimming performance of *Sarotherodon mossambicus* Proc. All India Seminar on Status of Environmental Studies of India held at Centre for Earth Science, Trivandrum during 26-28 March, 1981.

72. Sukumaran, N., Ramanathan, N. aud P. Natarajan, 1981. Acclimatisation and culture of milkfish, *Chanos changs* (Forskal) in freshwater composite fish culture system. Symposium on Estuarine Biology to be held at National Institute of Oceanography, Goa. (communicated)

73. Sundararaj, V. 1980. Monoculture and polyculture of carps. Seminar on Coastal and Inland Fish Culture in Tamil Nadu, 1980.

74. Sundararaj, V., Shailendri Krishnan and Raghavan, 1980. Mass culture of larvivorous fishes. Ibid.

75. Sundararaj, V., Joel, D. R., Sridhar, P., Sukumaran, N. and M. N. Kutty 1980. Recycling water in recirculation system for fish and prawn culture Ibid.

76. Sundararaj, V., and K Krishnamurthi, 1980. Distribution of copper in a mangrove. 2nd International Symposium on Mangrove.

77 Sundararaj, V. and K. Krishnamurthi, 1980. Aquaculture in brackishwater mangrove. Ibid. (communicated).

78. Sundararaj, V., Raghavan, B., and D. R. Joel, 1980. Towards multi-sided development. Kissan World (communicated).

79. Sundararaj, V. and N Ramanathan, 1980. Utilising the water hyacinth, Eichornia crassipes. Kissan World 7(8) : 37-39.

80. Sundararaj, V. and V, Ramadhas, 1980. The peculiar brine shrimp. Science Reporter (Accepted).

81. Sundararaj, V. and K. Krishnamurthy, 1981. A tidal cycle study in a mangrove. All India Seminar on Status of Environmental Studies in India. Proc. In press.

82. Sundararaj, V. and K. Krishnamurthy, 1981. Copper and phytoplankton production. Ibid.

83. Sundararaj, V. and V. Ramadhas, 1981. Fertility of a south Indian mangrove. Ibid.

84. Sundararaj, V. and P Natarajan, 1981. Bispecies culture of carps. Science and Culture.

85. Sundararaj, V. and P. Natarajan, 1981. Rational reservoir fishery management. Ibid.

86. Sundararaj, V. and P. Natarajan, 1981. Effect of a biocide on fish. Pesticides.

87. Sundararaj, V. and B. Srikrishnadhas, 1981. Lethal effect of phendal on Tilapia mossambica. Indian Journal of Environmental Health.

88. Sundaraj, V. and V. Ramadhas, 1981. Effect of sewage of fin and shell fish. Ibid.

89. Sundararaj, V., Natarajan, P. and M. D. K. Kuthalingam, 1981. Scope of mussel farming in brackishwaters. Sea Food Export Journal.

90. Sundararaj, V., Ramanathan, N. and K. Venkatasamy, 1981. Constraints of fish production in seasonal irrigation tank - a case study - Kissan World.

91. Venkataramanujam, K., Sukumaran, N. and G. Sanjeeviraj. Socioeconomic status of chank fishermen of Tuticorin coast - Symposium on Coastal Aquaculture by Marine Biological Association of India and Central Marine Fisheries Research Institute, Cochin - January '80.

92. Venkataramanujam, K., Santhanam, R.. Joseph, K. C. and P. Jeyachandran. Fish ry activities of Tuticorin. Publ. I. of Fisheries College, Tamil Nadu Agrl. University, pp. 20 (September, 1980).

AGRICULTURAL PROCESSING

1. Doraiswamy, G. Importance of drying. Paper presented at the subject-matter training-cum-duscussion. Paper presented at the Seminar on Post-Harvest Technology of Rice, TNAU, Coimbatore, 1980.

2 Murugesan, V. Cleaning and grading of paddy. Paper Presented at the subject-matter trainining-cum-discussion Seminar on Post-Harvest Technology of Rice, TNAU, Coimbatore, 1980.

3. Subramanian, V., Scope for agro-based rural industries in Tamil Nadu. Paper Presented at the Seminar on Stategies for Rural Development, TNAU, Coimbatore, 1980.

4. Subramaniyan, V. Utilisation of coir pith. Paper Presented at the National Seminar on Agricultural Waste Utilisation, TNAU, Coimbatore, 1980.

5. Subramaniyan, V. By-product and waste utilisation of rice. Paper Presented at the subject-matter training-cum-discussion. Paper presented at the Seminar on Post-Harvest Technology of Rice, TNAU, Coimbatore, 1980.

AGRICULTURAL STRUCTURES

1. Karai Gowder, K. R. and P. Natarajan. Sewege biogas plant : Addendum to the Conventional type. Paper Presented at the Workshop on Biogas Technology, TNAU, Coimbatore.

2. Karai Gowder, K R. and M. Mohan. Structures for water harvesting. Paper Presented at the Workshop on Water Harvesting Technique, TNAU, Coimbatore.

3. Karai Gowder, K. R. Paddy storage structures. Paper Presented at the Seminar on PHT (Rice), TNAU, Coimbatore.

FARM MACHINERY

1. Swaminathan, K. R., K. T. Kunhimohammed - Reducing percolation losses in paddy fields by helical bladed puddler and sheep foot roller. Paper Presented at the Agricultural Engg. & Technology Worshop - Kerala May 1980.

2. Swaminathan, K. R, M. Venkatasubramaniam, N. C. Vijayaragavan, P. Rajasekaran & S. Kamaraj, Gobar cell - Paper Presented at the Agrl. Engg. & Technology Workshop - Kerala May 1980.

3. Swaminathan K. R., Harvesting and threshing. Paper Presented at the Subject matter training-cum-discussion Seminar on Post Harvest Technology Tamil Nadu Agrl. University, November 1980.

4. Kamaraj, S., A note on Bioenergy - Paper Presented at the training-cum-discussion Seminar on Biogas Technology, Pondichery, December 1980.

5. Kamaraj, S., Comparative study of fixed dome biogas plant with drum type plant. Paper presented at the training-cum-discussion Seminar on Biogas Technology, Pondichery, December 1980.

6. Sampathrajan, A., N C. Vijayaragavan and K R. Swaminathan - Farm wastes for aquestic tiles. Paper Presented at National Seminar on Agrl. Waste Utilisation - TNAU, December 1980.

7. Swaminathan, K. R., R. K. Sivanappan and S. Kamaraj - Utility of biogas and biofuel. Paper Presented at training cum discussion Seminar on Biogas Technology - Pondichery, December 1980.

8. Diwakar Durairaj, C., and K R. Swaminathan - Shape factor analysis of ploughs - Paper Presented at the XVIII Annual Convention of ISAE, Karnal, February 1981.

9. Kamaraj, S., K. R. Swaminathan, N. C. Vijayaraghavan and P. Rajasekaran - Biogas from organic waste and its utilisation. Paper Presented at the XVIII Annual Convention of ISAE, Karnal, February 1981.

10. Kamaraj, S., and K. R. Swaminathan - Energy analysis on crop machine system in size reduction - Paper Presented at the XVIII Annual Convention of ISAE, Karnal, February 1981.

11. Kamaraj, S., K. R. Swaminathan and P. T. Palanisamy. Material science of biogas plants. Paper Presented at the XVIII Annual Convention of ISAE, Karnal February 1981

12. Manian, R. and K. R. Swaminathan. Choice of suitable farm power for arid and semi-arid region. Paper Presented at the XVIII Annual Convention of ISAE, Karnel, February 1981.

13. Manian, R., R Kaliappan and K. R. Swaminathan. Selection of suitable implements for arid and semi-arid regions. Paper Presented at the XVIII Annual Convention of ISAE, Karnal, February 1981.

14. Rangasamy, K. and K. R. Swaminathan. Studies on the different stresses on the paddy stem for developing harvester. Paper Presented at the XVIII Annual Convention of ISAE, Karnal, February 1981.

15. Rajendran, K., Kombairaj and K. R. Swaminathan. Energy utilisation in different agricultural operations in various crops Paper Presented at the XVIII Annual Convention of ISAE, Karnal, February 1981.

16. Sankaranarayanan, M and K. R. Swaminathan. Utilisation of solar energy for arid and semi-arid region. Paper Presented at the XVIII Annual Convention of ISAE, Karnal, Februay 1981.

17. Sankaranarayanan, M. and K. R. Swaminathan. Paper Presented at the XVIII Annual Convention of ISAE, Karnal, February 1981.

18. Swaminathan, K. R, S. Venkatanarayanan and P. Venkatachalam. Recycling of residue of agriculture and industries. Paper Presented at the Annual Convention of Association of Microbiologists of India.

19. Udhayakumar, R. and K. R. Swaminathan. Studies on the inter-relationship between the cotton boll characteristics and the picking force. Paper Presented at the XVIII Annual Convention of ISAE, Karnal, February 1981.

SOIL AND WATER CONSERVATION ENGINEERING

1. Balasubramanian, G. and R. K. Sivanappan, 1981. Effect of degree of slope and rainfall erositivity on soil erosion and the influence of mulching on run off and soil loss. Proc. of the South East Asian Regional Symposium on Problems of Soil Erosion and Sedimentation held at A.I.T. Bangkok, Thailand.

2. Chandrasekaran, D. and R. K. Sivanappan, 1980. Case studies on recharging ground water in Coimbatore District. Third Afro-Asian Regional Conference ICID, New Delhi.

3. Chandrasekaran, D and R. K. Sivanappan, 1981. Water management techniques to increase water use efficiency, ISAE, XVIII Convention, Karnal.

4. Sivanappan, R. K., M. Koteswaran and A. Alfred Newman Bright, 1981. Land and water use planing of watershed - A case study. ISAE, XVIII. Convention, Karnal.

5. Sivanappan, R. K. and D. Palaniswamy, 1980. Irrigation methods of sugarcane crop. Proc. of the 44th Annual Convention of the Sugar Technologists Association of India, Kanpur.

6. Sivanappan, R. K., 1980. Rainfall characteristics and their relation to soil erosion. International Seminar in Soil Conservation held at College of Agricultural Engineering.

7. Sivanappan, R. K., 1980. Water management practices for crops and field demonstrations.

8. Sivanappan, R. K., 1981. Economic use of groundwater Cardamom Vol. XIII, 17-25, January.

9. Sivanappan, R. K., 1981. Cloud Seeding in Coimbatore District Kissan World 8.

APPENDIX VI

POPULAR ARTICLES AND JOTTINGS PUBLISHED

Sl. No.	Title of article	Name of the Newspaper / Journal in which published.
	NEWSPAPERS	
	The Indian Express	
1.	Pest resistant rice varieties	29.5 80
2.	A novel insecticide in pest control.	21.8.80
3	Turmeric export corporation suggested.	6 2.81
	The Economic Times	
1.	Bhavanisagar irrigation project - A boon to farmers	12.4 80
2	Promising fodder tree.	29 5.80
3.	Coops ' role in dairy development vital.	9.7.80
4.	Seminar outlines strategy for rural development.	22.7.80
5.	Climatology role in irrigation stressed.	5 8 80
	The Hindu	
1.	*Eri* silk worms grow well on tapioca leaves	21 4.80
2	Pest management in rice.	23.4.80
3.	Science as a friend of the farmer.	27.4.80
4.	PKM 1 Mango	30.4 80
5.	Biogas for agro - engine.	30 4 80
6.	Farm scientists and land yield.	30 4 80
7.	Problems of small tea and coffee planters.	6.5.80
8.	Hybrid sheep for high wool yield.	7.5.80
9	Activated clay for pests in storage.	14 5.80
10	Impact of farm varsity research.	14.5.80
11.	Focus on genetic base of paddy.	18.5.80
12	Ultra short duration rice.	18.6.80
13.	Chitin inhibitors to control crop pests.	18.6 80
14.	Tractor drawn bed former.	18.6.80
15.	Pheromones to control cotton pest.	18 6.80
16.	Research station that helps rear better sheep.	25.6.80

17.	Effect of moulting inhibitor on brinjal beetles	2.7.80
18	Geese Farmers' friend and food.	2 7.80
19	Fungal control of crop pests.	9 7.80
20	Co 1 Pitchi	9.7.80
21	The mango in Phillippines.	9.7 80
22.	Sorghum research in Tamil Nadu.	6.8.80
23.	Seed treatment for cotton pests	6 8.80
24.	Why graps are sometimes scur.	14.1.81

Afternoon

1.	Diseases of guava and their control.	14.5 80
2.	Bronzy tomato wilt caused by thrips.	13 6.80
3.	How to combat peach leaf curl.	18 6.83
4.	Farm news from TNAU.	11.7.80

Dinakaran

1.	Orange cultivation.	21 8.80
2	Manuring oranges	4 9.80
3	Protecting orange trees.	11 9 80
4	Manuring arecanut.	18.9 80
5.	Pruning mangoes.	25 9 80
6.	Guava cultivation	2 10 80
7.	New sugarcane	9 10.80
8	Sugarcane with high sucrose	16.10.80
9.	Gingelly varieties	23.10.80
10.	Gingelly - Manuring	27.11.80
11.	Harvesting gingelly	4.12 80
12.	High yielding new tomato	5.12.81
13	Cumbu - How to sow?	18. 2.80
14.	Ragi aphids	8.1.81

Malai Murasu

1.	Poisonous weed	20 7.80
2.	"Marutham" tomato	13.1.81
3	"Punnagai" Hibiscus	13.1.81
4.	PKM 1 mango	13.1.81
5.	Our pongal gift	13.1.81

JOURNALS

Agricultural and Agro-Industries Journal

August 1980

1. Weed control in MCU 8 cotton.
2. Magnesium for increased potatoes in Nilgiris.
3. Economics of chillies production
4. Micro-nutrients for increased yields of blackgram.

TNAU NEWSLETTER

April 1980

1. Research station celebrates silver jubilee.
2. Rare palm species.
3. Effect of weather on yield of groundnut.
4. Bund cropping in rice fields.
5. Early rice culture TNAU 8872.
6. Effect of irrigation and nitrogen on sorghum CSH 5.
7. Volatilisation loss of ammonia from soils
8. Rice earhead bug control.
9. Carbofuran in the non target fauna.
10. Control of chilli white aphid.
11. Control of sucking pests of chillies.
12. Appreciable qualities of animals and birds.
13. Varietal resistance to the white backed plant hopper in rice.
14. Seedling bulk screening test
15. Influence of water depth on the survival of murrel young ones.
16. Maturity standards for apples
17. High yielding ragi culture for Dharmapuri district.
18. A new plant type in redgram.
19. A superfine rice suitable for Dharmapuri district.
20. A high yielding culture of turmeric.
21. A high yielding coriander culture
22. Performance of coconut hybrids.
23. Copper deficiency in cumbu.

May 1980

24. Age of merino breed on wool.
25. Preferable crossbred cow for Madras.

26. Landed cost of milk.
27. Farm labour of Nilgiris.
28 Impact of long term finance.
29 Fertilizer for bellary onion.
30. Mutagenesis in *sorghum*.
31. Control of chilli white aphid by dusting.
32. Infectivity tests of NPV of prodenia.
33. Impact of TNAU correspondence course.
34 Rice sheath rot control.
35 Period of sowing for sugar beet in plains.
36. Nematode and root rot control of sugar beet.
37. Diagnosis of iron chlorosis in maize.
38 Economics of mixed farming.
39. Combined use of insecticide and weedicide in banana.
40. Grading eucalyptus seeds.
41. Protein analyser.

June 1980

42. Impact of Farm School on All India Radio.
43 Birth weight in different genetic groups.
44. Resistance to leaf folder in rice.
45. Decision making under risk.
46. Model for ideal plant selection
47. Spacing and nitrogen level for chilli.
48. Cardamom capsule rot control.
49. Nitrogen level and population density for MDU 1 paddy.
50. Nitrogen and pruning requirement of Edward rose.
51. Effect of chemical defoliant on MCU 9 cotton
52 Maize seed pre-treatment and depth of sowing.
53. Multiple cropping for rainfed lands.
54. Kharif season planting.

July 1980

55. Quick methods to assess the seed viability.
56. Selection in eucalyptus nursery.
57. Promising coconut hybrid.
58. Biological control of *Solanum elaegnifolium*.
59. Fertilizer for onion.

60 New formula to measure evapotranspiration.

61. Pathogenicity of NPV.

62. Cotton stem weevil.

63. Control of cardamom stem borer.

64. Effect of SPIC effluents on the survival of *Sarotherodon mossambicus*.

65. Afalatoxin in feed samples.

August 1980

66. New instruments.

67. Leaf area meter.

68. Infra red gas analyser.

69. Seed production technology : Paddy and tomato.

70. Activated clay and fungicides on Rhizobium.

71. Bollworm incidence on promising cultures.

72. Control of citrus nematode in acid lime.

73. Control of mango anthracnose disease.

74. Optimum nitrogen and seed rate for rainfed paddy.

75. Response to potash fertilization.

76. Intercropping in banana.

77. Role of ticks in babesiosis.

78. Incidence of piroplasmosis in cattle.

79. Farm information source utilisation.

80. Adoption behaviour of cotton growers

September 1980

81. Growth of mrigal in polyculture.

82. Cage culture of freshwater prawn.

83. Thornless prosopis.

84. Weeds for energy.

85. Cropping pattern for summer irrigated cotton region.

86. Pigeon pea cyst nematode.

87 Marketing of cattle.

88. Rainfall impact on yield of crops.

89. Storing the hatching eggs.

90. Treatment for snoring disease in cattle.

91. Few more eucalyptus for plains.

92. TNAU hand pump.

93. Carrots for Kodaikanal.

October 1980

94 Effect of Azolla on rice.
95 Intercropping of cocoa in coconut.
96. Characteristics and motivational sources of broadcast audience.
97. Growth equations.
98. Pests in gingelly pods
99 New method of propagation in cashew.
100. Determination of consumptive use of sorghum.
101. Nitrogen requirement of turmeric.
102 Increasing late Kharif rice yield.
103. Ratooning studies in rice.
104. Spacing for rainfed sorghum.
105. Weeding tools and mulches in dryland sorghum.
106. Teaching of English for sciences.

November 1980

107. New varieties released
108 "Thilagam" *Hibiscus rosasinensis.*
109. "Punnagai" *Hibiscus rosasinensis.*
110. "Marutham" tomato
111. Lethal time of Nuvan on common carp.
112. Salinity tolerance of prawns.
113. Vegetative propagation in eucalyptus.
114. Maximum body weight in sheep.
115. Incidence of theileriasis in cattle.
116. Deep freezing of ram semen.
117. Develpmental forms of babesia in tick vectors.
118 Defoliants study on cotton.
119. Use of Azospirilum.
120. Utilization of pollutants.
121 Time of sowing for jute.
122. Control of Thanjavur wilt of coconut.
123 Performance of X 4 cumbu.
124. Accumulation of organic matter in paddy soil.
125. Economics of new farm practices.
126. Respiration model II.

127. Cabbage varieties for Kodaikanal.
128 Fennel cultivation at Coimbatore.
129 Reniform nematode resistance in tomato.
130. Percolation loss in paddy fields.
131. Brinjal-Production and marketing problems.
132. Farm broadcast influences innovation adoption.

December 1980

133. Nutrient deficiency in coconut.
134. It pays to intercrop in rainfed sorghum.
135 Methods to conserve soil moisture.
136. T. S. H. 25-A promising cotton culture.
137. A high yielding cowpea culture.
138. Greengram diseases control.
139. Yield loss due to yellow mosaic infection in greengram.
140. Dissipation of insecticides applied to radish.
141. Varietal susceptibility to root knot nematode in tobacco.
142. Respiration model.
143. Mulching in turmeric.
144. Rapid multiplication in turmeric.
145. Pea cultivars for Kodaikanal.
146. Effect of growth regulators on fox glove.
147. Ratooning of annual moringa.
148 Thiophanate in gastro-intestinal nematodiasis of ruminants.
149. Hatchability of eggs.
150. Multipurpose tool bar.
151. Single row seed drill
152. CBD to transmit technical know-how.
153. Constraints for yield gap in potato.
154. Sewage pollution in Tuticorin coastal waters.
155. Effects of food rationing in cat fish.
156. Bispecies culture of fish.

January 1981

157. Callus induction and plantlet regeneration in wild peanut
158. A better method for fish seed survival and rearing.
159. Vitamins in fertility and hatchability of eggs.
160. Suitable time for planting cardamom.

161 Control of spice beetle.
162. Ratooning in banana
163. Effect of micronutrients on acid lime
164 Arecanut dehusker.
165. Seed rate for eucalyptus.
166. Lab lab seed storage.
167. Date of sowing and spacing on powdery mildew incidence on pulses.
168. Effect of irrigation regimes and mulches on sorghum Co 23.
169. Alternative crop for rainfed black cotton soils.
170. Tungro resistant rice variety.
171. Opinion research with radio listeners.
172. Rationing artificial fish feed
173. Control of letoparasites of poultry.
174. Japanese quails as an experimental animal.
175. Closprostenol treatment for anoestrum in buffaloes.
176. Snitation of the farm dairy equipment.
177. NB 21 A promising fodder grass for rainfed black soil tract.
178. Use of fertilizer at farm level.
179. Control of sorghum downy mildew.
180. Control of leaf spot disease of rose.
181. Greengram germplasm-An evaluation.
182. Effect of season, spacing and nitrogen on maize, sorghum and ragi.
183. Pineapple is a profitable intercrop in coconut.
184. Hand pollination in snnflower.
185. Increase in cotton yield by combination sprays.
186. Grafting crossandra on barleria rootstock.

March 1981

187. Evaluation for superior genetic source in eucalyptus.
188. Azolla production from sporocarp.
189 Biocell.
190. Ginger under multicropping.
191. Effect of mycorrhiza on acid lime.
192. Perilla-A new aromatic plant for Kodaikanal.
193. Suitable feed for culture of the edible crab.
194. Salmonellosis in Pigs-An investigation.
195. Isolation of Salmonella gallinarum.
196. Influence of Liv 52 on broiler growth rates.

197. Promising sunflower hybrid.
198. M_3 - Promising greengram culture
199. Control for chillies powdery mildew.
200. Dissipation of insecticides in cowpea green pods.
201. Performance of IR 50 in Kuruvai
202. High oil yield in hybird coconut.
203. Sowing of rainfed sorghum.
204. Control of sucking pests of brinjal.
205. Identification of resistant blackgram types to rust disease.
206. Transfer of all research activities to TNAU
207. Paddy Processing Research Centre, Tiruvarur, affiliated to TNAU.
208. New research scheme.

KISAN WORLD

April 1980

209. Garlic extract for insect control.
210. Shervaroy hills suited for pineapple.
211. Economics of forest plantations - Eucalyptus and casuarina.
212. Control of cardamom stemborer.
213. A forage legume-Vigna marina.
214. Checking blister blight and red rust of tea.

May 1980

215. Promising temperate vegetables for rainfed culture in hills.
216. Capsule for bunchy top.
217. Organic manure for nematode control.
218. Nursery medium for eucalyptus.
219. MDU 1 - A new rainfed rice.
220. Tips for tube rose.
221. Crop-weed competition in bunch groundnuts.
222. Quick quality test for cardamom.
223. Acute parturient paresis in a crossbred cow.

June 1980

224. Cucumber *Cucumis sativus* Linn.
225. Carrots for the plains.
226. Effect of nitrification on cotton MCU 5.

227 Ginger Its medicinal uses.
228. Control of cardamom stemborer.
229 Chicory cultivation
2 0. Relay-race in scientific crop production

July 1980

231. Chilli-Varieties and cultivation.
232. High yielding "mullai" CO 1.
233. CO 1 "Pitchi".
234 Control of chilli white aphid by dusting
235. Diseases of pineapple and their control.
236. Pineapple cultivation experiments.
337 Magnesium for increased potatoes in Nilgiris.
238. Sequence of season, spacing and nitrogen on seed yield of jute varieties
239 Micro nutrients for incfeased yields of blackgram
24 . Nematode and root rot control of sugarbeet.
241. Cheap semen freezer
242. Copper sulphate for better breeding efficiency of cows.
243. Effect of age on greasy fleece yield in Grozney merino breed.
244. Increasing body weight of broilers.
245. Restricting feeding time in broilers
246. Tenderization of meat.
247. Low density mash for fowls
248. Preservation of shell eggs.
249. Rearing of broiler chicks
250. Adlibitum feeding of grass carp.

September 1980

251. Simple management techniques for realising maximum yield potential of rice
252 Rice sheath rot control.
253. Water management in paddy fields.
254. A high yielding culture of turmeric.
255. A superfine rice suitable for Dharmapuri district.
256. Insect pests of rice and their management.

Novembr 1980

257. Introducing advanced methods of irrigation in Tamil Nadu.
258. Role of variety-An important component of rice productin

259. Curcuma species.
260. Package of practices of coriander
261. First aid antidotes.
262 Tomato
263 Tree as a barrier of conservation and wealth.
264. Resistance of leaf folder in rice.
265 Influence of fertilizer and chemicals on the harvest and maturity of sorghum.
266 Economics of sunflower cultivation in a dry land region.
267 Spacing and nitrogen level for chilli.
268. Cardamom capsule for control.
269. Save fossil fuels
270. Treatment of ancylostomiasis in dogs.
271. Response of potash fertilizerion
272. Tomato seed technology.
273. Optimum nitrogen and seed rate for rainfed paddy.

Febraury 1981

274. Increasing water potential for Tamil Nadu.
275 Problems of tractorisation
276. Edible mushroom in Tamil Nadu.
277. Vegetative propagation in eucalyptus
278. Cloud seeding in Coimbatore district.
279. Tomato IM 39.
280. Destructive sorghum diseases and their control.
281. Intercropping of cocoa in coconut.

March 1981

282. Pigeon pea - Some aspects
283. High yielding "gundu" chilli.
284. Fennel - A new pice crop for Tamil Nadu.

UZHAVAR VELANMAI

July 1980

1. Quality of Krishnagiri reservoir water.
2 New findings in mango pruning.
3 To get high yield in rose.
4. Bud shedding in cotton.

ER UZHAVAN

June 1980

1. Special features of female insects.
2. Higher income from coconut gardens.
3. Carrot for plains.

July 1980

4. Shed for milch cows
5. Backyard garden.
6. Cauliflower for plains.
7. Viral and bacterial diseases of rice
8. Pests Some statistics.
9. Greens in our diet.
10. Pig rearing for prestige
11. Insects are also similar to man.
12. Radish suitable for plains.
13. Diseases that spread through pork

September 1980

14. Pests of cardamon
15. Organic manures and physical properties.
16. Nitrogen and rice quality

October 1980

17. Valarum velanmai
18. Deworming in sheeps.
19. PKM 1 tomato.
20. Usefulness of soil testing.
21. Role of agriculture in industrial development.
22. Calf rearing - For your attention.

November 1980

23. New cumbu
24. Poverty - An overview.
25. Rearing silkworms.
26. Disease control in goat rearing.
27. Known insects - Unknown information.

28. Farm budgeting

29. Vettiver.

December 1980

30. Getting more income in coconuts.

January 1981

31 Speedy multipltcation of turmeric.

32. "Marutham" tomato.

33. Control of turmeric thrips.

34. Ginger cultivation.

35. Vegetables and their curing properties.

36. Short duration radish suitable for multiple cropping.

37. Beneficial effects of greens

38. Nematodes that infest rice crop.

PANNAI THOZHIL

July 1980

1. Alkaline soil and rice cultivation.
2. Nitrogen and rice quality.
3. Storing limes for longer period.
4. Onion-Problems in production and marketing.

August 1980

5. Protein in our diet.
6. Cumin.
7. Nutmeg.

September 1980

8. Income in pulses
9. Frozen semen for dairy development.

October 1980

10. Vegetables suitable for shervaroy hills.
11. Super rice seedlings.
12. Tea mosquito of cashew.

November 1980

13. Leaf blight disease and weather conditions.
14. Moringa

15. Late blight of cashew.
16. Will pulses yield?

December 1980

17. Pests of crops and control measures.

January 1981

18. Pudukkottai district benefitted by pulses research.
19. Tungro disease of rice.
20. Importance of seasonal egg yield.
21. Stem borer of cashew

VIGNANA VIVASAYAM

May 1981

1. Control measures for rice fulgorid.
2. Information on irrigation water.

July 1981

3. Rice root nematode.
4. Barriers of rainfed farming.
5. Pest problem in rice crop.
6. Maintenance of milch cow.
7. Bacterial leaf spot.
8. Efficiency of Merino.

August 1981

9. Clove.
10. Mobile artifical insemination unit

UZHAVAR MADAL

July 1981

1. Blackgram in rice field bunds.
2. Rice.
3. Cultivation tips for MDU onion.
4. Cholam in drylands.
5. Let us eradicate fulgorid.
6. Bluegreen algae for rice fields.
7. Rice root dip in dursban

SAKTHI SEITHI MADAL

August 1980

1. Tamil Nadu Agricultural University, Coimbatore.

SEITHI KADIR

May 1980

1. Wonder "Kitchadi" rice for Dharmapuri district.

VALARUM VELANMAI

April 1980

1. Today's calves-Tomorrow's bullocks.
2. Chemical manures and water absorption.
3. Mixed farming is profitable.
4. Importance of soil testing.
5. Poultry farms.
6. Lemon cultivation.
7. Maintenance of registers for livestock.
8. Fodders suitable for "Chitrai".
9. CO. 24 sorghum cultivation.
10. Compensating fish meal deficit in poultry ration.
11. Cultivation tips for "Chitrai".
12. Control of pests for higher cashew yield.
13. Small onion in "Chitrai".

May 1980

14 Ways for prosperity.
15 Role of glass house for plant disease research.
16. Diseases spread by drinking water.
17. Sandino - New sheep.
18. Cultivation tips for "Vaikasi".
19 Fish meal pelletizer
20. Credit sources for ragi growers
21. For newly calving cows.
22. Intercrop in rainfed cotton.
23. White pigs rearing.
24. Onion cultivation Question-answer.

June 1980

25. Dryland agriculture
26 Some rare proverbs.
27. Millets suitable for drylands.
28. New groundnut suitable for drylands
29 MDU 1 rice for rainfed lands.
30 CO 1 "mochai" suitable for drylands.
31. Agriculture and culture
32. Cultivation tips for "Ani"
33 Lab to drylands.
34 Rainfed pulses and bio-fertilizers
35 Diseases of rainfed crops
36. Greengram suitable for dry cultivation
37 To get profit from poultry farm.
38. Tomato and brinjal - Question-answer.

July 1980

39 Livestock improvement in Tamil Nadu.
40 Livestock development programmes
41. Moulds in cattlefeed.
42. Livestock research in Tamil Nadu.
43 Urinal disease in hill cattle
44. Uterus lowering
45. Buffalo wealth
46. Leather industry waste and agriculture.
47. Bad effects of pesticides to cattle.
48 Poultry farming An overview
49. Role of cattle manure in improving soil.
50. Dairy farming · Question - answer.

August 1980

51. Mind to grow trees.
52. Mango cultivation in philippines.
53. Cultivation tips for "Avani".
54 To get high yield from CO 3 redgram.
55. CO 1 pitchi.
56. Snails.
57 Hybrid coconut for prosperity.

58. Irrigation and agriculture in Vietnam.
59. Control of stem borer.
60. Our land area and population.
61. Protein content in cholam.
62. Breaking groundnut seed dormancy.
63. Question - answer.

September 1980

64. Towards prosperity.
65. Maintenancc of newly calved cows.
66. Gobar cell.
67. Diseases of cholam and their control.
68. Barriers in rainfed farming.
69. Seed extraction in brinjal.
70. Mycotoxin - Poisonous.
71. Sunflower seed storage.
72. Turmeric - A medicinal plant.

October 1980

73. Sweet potato : Question-answer.
74. Asian Vegetable Research and Development Centre, Thai
75. Woman and home science education.
76. He-bulfaloes' right age for service.
77. Nationalised banks in agriculture.
78. New method of pest control.
79. Cattle insurance.
80. A thornless prosopis.
81. Forced moulting of poultry.
82. Proverbs relating to soil testing.
83. Selecting egg laying birds.
84. Fuel gas.

Novemher 1980

85. Prosperity in agriculture.
86. New cumbu.
87. Cowpea CO 3.
88. Poultry - A profitable subsidiary occupation.
89. Mosaic in cardamom.

90. Some facts about population.
91. Low production in potato.
92. Do you want mushroom spawns?.
93. Kumaraperumal Farm Science Centre, Trichy - An introduction.
94. Increasing sorghum yeild.
95. How to obtain high yield in guava.
96. Agricultural education through radio.
97. Palac - Nutritious green
98. Rearding crossbred calves.
99. "Marutham" tomato.
100. Broiler birds - Development programme.
101. Monthly cultivation tips for "Karthigai".

December 1980

102. New Hibiscus varieties.
103. Pest management in rice.
104. Dairy management in western countries.
105. Gobar gas plants
106. Cultivation hints for "Margazhi".
107. For the attention of ragi growers.
108. Increasing dry chilli yield of MDU 1.
109. To get bigger guava fruits.
110. Calving intervals.

January 1981

111. Let there be prosperity - Let there be newness.
112. Extraction of quality seeds from tomato.
113. New gundu chilli.
114. Hand pump of TNAU.
115. Water hyacinth.
116. Turmeric marketing.
117. Long ribbed gourd.
118. "Thai" monthly hints.

February 1981

119. Our innovations.
120. Goat rearing
121. Dairy management in wastern countries.

122. Gabar gas plants.
123. CO 1 groundnut
124 Artificial culture of fish.
125. Fish production in future.
126. Onion along with turmeric.
127. Uses of neem cake
128. Cauliflower suitable for plains
129. Diseases of cumbu
130. Simple method to prevent banana rotting.
131. Moisture retention capacity of Kovilpatti black soils.

March 1981

132. From Sri Lanka.
133. Control of banana nematode.
134. Cultivation hints for rainfed cotton.
135. Dishes from soybeans
136. Goat rearing in future.
137. Duck rearing in Chingleput district.
131. Micro-nutrients for ragi.
139. Treatment for livestock.
140. New onion.
141 Role of oil in diet.
142. Single row seed drill.
143 Chilli cultivation for high income.
144. Beneficial micro-organisms in gobar gas production.
145. Anaikompan in rice.
146. Neem cake and plant protection.
147. Arecanut dehusker.

APPENDIX VII

NUMBER OF ENQUIRIES ANSWERED, QUANTITY OF SEEDS DISTRIBUTED, CASES TREATED ETC.

(1)	(2)	(3)
I.	**AGRICULTURE**	
a)	Number of enquiries answered directly	1870
b)	Number of enquiries answered through AIR	1258
c)	Quantity of seeds sold through the Seed Depot at Coimbatore	30.42 tonnes
d)	Total number of ART conducted	64
e)	Total number of correspondence courses offered	8
f)	Total number of participants	550
g)	*Total number of participants who attended the* contact programme	196
h)	Total number of lessons broadcast under Farm School on AIR	54
i)	Total number of participants	1594
j)	Total number of participants who attended the contact programme	410
II.	**ANIMAL HISBANDRY**	
a)	Number of enquiries answered	8,244
b)	Kg. of milk produced and sold	3,46,956 } 1,16,792 }
c)	Eggs produced.	7,32,612
d)	Eggs sold :	
	i. For table purpose	6,41,536
	ii. Hatchings eggs	28,805

(1)	(2)	(3)
e)	LivestocK including poultry sold	29,860
f)	Cases treated	1,52,113
g)	Artificial insemination done	9,733
h)	No. of doses of Frozen Semen supplied	8,076
i)	Vaccines done	
	Poultry	49,307
	Cattle	1,651
	Sheep and Goat	8,468
	Dog	73
j)	Vaccines supplied	76,900
k)	Specimens examined	32,531
l)	Histopathological examinations made	5,720
m)	Post-mortems conducted for private agencies	945
n)	Blood smears examined	2,795
o)	Cultural examinations done	2,052
p)	Health certificates issued.	120
q)	Seed and plant materials distributed	19,300 slips of NB 21
r)	Number of laboratory animals supplied	3,913 value Rs. 21,291

APPENDIX VIII

ALL-INDIA RADIO BROADCAST

1.	2.4.80	Farm Schooi on AIR(FSA): Fruit-cultivation-Mango varieties and cultivation.	Dr. V.N. Madhava Rao Dean (Agri.)
2.	3.4.80	Sterility in cattle	Dr. C.A. Gopalakrishnan Professor and Head, Animal Husbandry
3.	5.4.80	Pests of bhendi and their control	Dr. M. Gopalan Associate Professor, Agrl. Entomology
4.	5.4.80	Co. 24 Cholam	Dr. M.N. Prasad Associate Professor Agrl. Botany
5.	6.4.80	FSA: Mango varieties and cultiva tion	Dr. V.N. Madhava Rao Dean (Agri.)
6.	9.4.80	FSA: Mango pests and their control	Dr. M. Mohanasundaram Associate Professor Agrl. Entomology
7.	13.4.80	,,	,,
8.	13.4.80	Let us find out the way for prosperity-Symposium	Th. A. Venkataraman Vice-Chancellor Dr. P.K. Aiyasamy Professor and Head, Agrl. Economics & others
9.	14.4.80	Silver jubilee of Agrl. Research Station, Bhavanisagar.	Th. A. Venkataraman Vice-Chancellor Chief Scientist & others
10.	16.4.80	FSA: Grape varieties and planting	Th. P. Selvaraj Assistant Professor Pomology

11.	19.4.80	Co. 3 Varagu	Th. N. Sundaresan Assistant. Professor Agrl. Botany
12.	19.4.80	Co. 1 Mochai	Th. P. Sivasubramaniam Assistant Professor Agrl. Botany
13.	20.4.80	FSA: Grape varieties and planting	Th. P. Selvaraj Assistant Professor Pomology
14.	23.4.80	FSA: Grapes pruning and cultivation	"
15.	26.4.80	Nematode attack in crossandra	Tmt. Sivagami Vadivelu Associate Professor Agrl. Entomology
16.	26.4,80	Aphids on ragi	Th. G. Balasubramaniam Assistant Professor Agrl. Entomology
17.	27.4.80	FSA: Grapes pruning and cultivation	Th. P. Selvaraj Assistant Professor Pomology
18.	30.4.80	FSA: Diseases of grapes and their control	Tmt. Parambaramani Assistant Professor Plant Pathology
19.	1.5.80	Let us think to solve problems: How to solve plant protection problems.	Dr. M. Balasubramaniam Professor and Head, Agrl. Entomology
20.	3.5.80	Nematodes on crossandra	Tmt. Sivagami Vadivelu Associate Professor Agrl. Entomology
21.	3.5.80	Aphids on ragi	Th. G. Balasubramaniam Assistant Professor Agrl. Entomology
22.	4.5.80	FSA: Diseases of grapes and their control	Tmt. Parampparamani Assistant Professor Plant Patholoy

23.	5.5.80	Cow dung to energise transistor	Thi. V. K. Shanmuganathan and S. Kamaraj Research Associates Farm Machinery
24.	7.5.80	FSA: Lemon cultivation	Th. M. Kulaseraran Associate Professor Pomology
25.	10.5.80	Inducing fish hatching	Th. Samuel Palraj Assistant Professor Fishery Science
26.	10.5.80	"Seeragam" cultivation	Th. S. Syed Assistant Professor Horticulture
27.	11.5.80	FSA: Lemon cultivation	Th. M. Kulasekaran Associate Professor Pomology
28.	14.5.80	FSA: Guava cultivation	,,
29.	17.5.80	Fish culture in sewage	Th. Samuel Palraj Assistant Professor Fishery Science
30.	17.5.80	X4 Hybrid cumbu	Th. C. Nagarajan Associate Professor Agrl. Botany
31.	18.5.80	FSA : Guava cultivation	Th. M. Kulasekaran Associate Professor Pomology
32.	24.5.80	"Seeragam cultivation"	Th. S. Syed Assistant Professor Horticulture
33.	24.5.80	Fish in our diet	Th. Samuel Palraj Assistant Professor Fishery Science
34.	25.5.80	FSA: Jack and sapota cultivation	Th. S. Balasubramaniam Associate Professor Horticulture
35.	28.5.80	FSA: Papaya varieties and cultivation	Th. S. Sathiyamoorthy Assistant Professor Horticulture

36.	30.5.80	Methods of economising irriga-rion water	Th. J. Oliver Deputy Director, FTC
37.	31.5.80	Nematodes attaking patcholi	Th. C. R. Gunasekaran Assistant Professor Agrl. Entomology
38.	31.5.80	New findings in fresh water fish culture	Th. Samuel Palraj Assistant Professor Fishery Science
39.	1.6.80	FSA: Papaya varieties and cuti vation	Th. S. Sathiyamoorthy Assistant Professor Horticulture
40.	1.6.80	Seminar on turmeric and ground-nut held at Anaimalai	Th. Dr. S. Sankaran Professor and Head Agronomy, Th. K. T. Subbaraja Assistant Professor Plant Pathology and Dr. Jabamani Rabindra Assistant Professor Agrl. Entomology
41.	4.6.80	FSA: Hill banana and wetland banana	Th. S. Sathyamoorthy Assistant Professor Horticulture
42.	5.6.80	'Kovai'-A new seed drill	Th. R. Karunanithi Assistant Professor Agrl. Engineering
43.	7.6.80	Plant pιotection chemicals and fishes	Th. Samuel Palraj Assistant Professor Fishery Science
44.	8.6.80	FSA: Hill banana and wetland banana	Th. S. Sathyamoorthy Assistant Professor Horticulture
45.	10.6.80	New forage crops	Dr. M. Balasubramaniam Associate professor Forage Crops

46.	11.6.80	FSA: Temperate fruits	Th. M. Kulasekaran Associate Professor Horticulture
47.	11.6.80	New gobar gas plant	Th. S. Kamaraj Research Associate Agrl. Engineering
48.	14.6.80	Nematodes and fungal diseases of bhendi	Th. P. Balasubramaniam Research Associate Agrl. Entomology
49.	14.6.80	Greens in our diet	Tmt. A. SuseelaThirumaran Assistant Professor Food Technology
50.	15.6.80	FSA: Temperate fruits I	Th. M. Kulasokaran Associate Professor Horticulture
51.	18.6.80	FSA: Temperate fruits II	,,
52.	19 6.10	Crop rotation-Discussion	Dr. S. Sankaran Professor and Head Agronomy
53.	21.6.80	Protein in our diet	Selvi. G. Manimegalai Assistant Professor Food Technology
54.	21.6.80	Chilli thrips	Th. Ajis Bhasa Assistant Professor Agrl. Entomology
55.	22.6.80	FSA: Temperate Fruits - II	Th. M. Kulasekaran Associate Professor Horticulture
56.	25.6.80	FSA : Fruit cultivation summary and questions	Dr. V. N. Madhava Rao Dean (Agri)
57.	28.6.80	Rice root nematode	Th. S. Palanisamy Assistant Professor Agrl. Entomology
58.	28.6.80	Chilli aphids	Th. Ajis Bhasa, Assistant Professor Agrl. Entomology

59.	29.6.80	FSA : Fruit cultivation summary and questions	Dr. V. N. Madhava Rao Dean (Agrl.)
60.	30.6.80	Tube rose	Th. S. Sambandamoorthy Associate Professor Floriculture
61.	1.7.80	House trees	Th. V. Anjanam Azhagiya pillai Assistant Professor Horticulture
62.	1.7.80	FSA : Importance and cultivation of groundnut	Th. A. N. Venkateswaran Associate Professor Agrl. Botany
63.	5.7.80	Chilli muranai	Th. Ajis Bhasa Assistant Professor Agrl. Entomology
64.	5.7.80	Greens for eyesight	Tmt. A. Suseela Thiru-maran Assistant Professor Food Technology
65.	6.7.80	FSA : Importance and cultivation of groundnut	Th. A. N. Venkateswaran Associate Professor Agrl. Botany
66.	7.7.80	A mind to grow trees	Th. A. Venkataraman Vice-Chancellor
67.	9.7.80	FSA : Cultivation details of groundnut	Th. A. N. Venkateswaran Associate Professor Agrl. Botany
68.	12.7.80	Fruits and fruit products	Dr. S. Neelakandan Professor and Head Food Technology
69.	12.7.80	Nematodes of bhendi	Th. P. Balasubramaniam Research Associate Agrl. Entomology
70.	13.7.80	FSA : Cultivation details of gro-undnut	Th. A. N. Venkateswaran Associate Professor Agrl. Botany

71.	16.7.80	FSA : Oilseeds lesson III	Th. G. Venkatesan Associate Professor Agronomy
72.	17.7.80	Do old varieties require fertilizers or not-Symposium	Dr. S. Sankaran Professor and Head Agronomy
73.	19.7.80	Hulling pulses and nutrients	Dr. S. Neelakandan Professor and Heaad Food Technology
74.	19.7.80	Rice root nematode	Th. S. Palanisamy Assistant Professor Agrl. Entomology
75.	20.7.80	Importance of gingelly cultivation	Th. G. Venkatesan Associate Professor Agronomy
76.	23.7.80	FSA : Gingelly varieties and cultivation	Th. G. Venkatesan Associate Professor Agronomy
77.	24.7.80	Agricultural Quiz	Dr. A. John Knight Professor and Head Agrl. Extension
78.	26.7.80	Greens in our diet	Tmt. S. Suseela Thirumaran Assistant Professor Food Technology
79.	26.7.80	Fruits and fruit products	Dr. S. Neelakandan Professor and Head Food Technology
80.	27.7.80	FSA : Gingelly varieties and cultivation	Th. G. Venkatesan Associate Professor Agronomy
81.	30 7.80	FSA : Importance and varieties of coconuts	Th. A. N. Venkateswaran Associate Professor Agrl. Botany
82.	2.8.80	Hulling pulses and nutrients	Dr. S. Neelakandan Professor and Head Food Technology

83.	2.8.80	Vitamins for good health	Tmt. S. Suseela Thirumaran Assistant Professor Food Technolgy
84.	3.8.80	FSA : Importance and varieties of coconut	Th. A. N. Venkateswaran Associate Professor Agrl. Botany
85.	3.8.80	Neem cake powder coating to urea	Th. R. Sivasamy Agri. Student
86.	3.8.80	Increasing the efficiency of urea	Th. V. R. Sridharan Agri. Student
87.	3.8.80	Improved 'Pai' nursery for rice	Th. M. A. Shanmugam Agri. Student
88.	6.8.80	FSA : Coconut nursery and cultivation	Th. A. N. Venkateswaran Associate Professor Agrl. Botany
89.	6.8.80	Blue green algae for rice	Th. C. Balamurugan Agri. Student
90.	10.6.80	FSA : Coconut nursery and cultivation	Th. A. N. Venkateswaran Associate Professor Agrl. Botany
91.	13.8.80	FSA : Castor and safflower varieties and cultivation	Th. L. Arunachalam Assistant Professor Agronomy
92.	15.8.80	To stabilize green revolution	Th. A. Venkataraman Vice-Chancellor
93.	17.8.80	FSA : Castor and safflower varieties and cultivation	Th. L. Arunachalam Assistant Professor Agronomy
94.	17.8.80	Granule application for cholam	Th. V. Jeevanandam Agri. Student
95.	17.8.80	Rice seed treatment	Th. K. Nagarajan Agri. student
96.	17.8.80	Banana rot	Th. P. Muthusamy Agri. student

97.	20.8.80	FSA : Sunflower varieties and cultivation	Th. G. Purushothaman Associate Professor Agrl. Botany
98.	20.8 80	Mushroom	Th. V. Rajendran Agri. student
99.	24.8.80	FSA : Sunflower varieties and cultivation	Th. G Purushothaman Associate Professor Agrl. Botany
100.	27.8.80	FSA : Pests of oilseeds	Th. P. Vasudevamenon Associate Professor Agrl. Entomology
101.	28.8.80	Agricultural Quiz	Th. R. Netaji Seetharaman Assistant Director Communication Centre
102.	30.8.80	Fenugreek	Th. S. Syed Assistant Professor Horticulture
103.	30.8.80	Leaf blight of rice	Th. Sivaprakasam Assistant Professor Plant Pathology
104.	31.8.80	FSA : Pests of oilseeds	Th. P. Vasudevamenon Associate Professor Agrl. Entomology
105.	3.9 80	FSA : Diseases of oilseeds	Dr. P. Narayanasamy Associate Professor Plant Pathology
106.	4.9.80	Let us solve water potential depletion	Prof. R. K. Sivanappan Dean (Agrl. Engineering)
107.	6 9.80	Pests of crops and their control	Th. G. Balasubramaniam Assistant Professor Agrl. Entomology
108.	6.9.80	Petrol engine operated by gobar gas	Th. R Netaji Seetharaman Assistant Director Communication Centre
109.	7.9.80	FSA : Diseases of oilseeds and their control	Dr. P. Narayanasamy Associate Professor Plant Pathology

110.	8.9.80	Debeaking birds	Th. V. Ganesh Raja, Agri Student
111.	8.9.80	Delousing birds	Th. C. Chandrasekaran, Agri Student
112.	10.9.80	FSA : Storing oilseeds	Th. L. Arunachalam, Assistant Professor Agronomy
113.	13.9.80	Cow dung to produce electricity	Th. S. Netaji Seetharaman, Assistant Director Communication Centre
114.	13.9.80	Research in high yielding eucalyptus	Dr. M. Ratnam, Associate Professor Forestry.
115.	14.9.80	FSA : Storing oilseeds	Th. L. Arunachalam, Assistant Professor Agronomy
116.	17.9.80	FSA : Bacterial culture for groundnut	Dr. D, Oblisami, Professor and Head, Agrl. Microbiology
117.	20.9.80	Rice cultivation in wetlands Seminar	Dr. S. Sankaran, Professor and Head Agronomy
118.	21.9.80	FSA : Bacterial culture for groundnut	Dr. G. Oblisami, Professor and Head Agrl. Microbiology
119.	21.9.80	Sericulture and coconut-Seminar	Th. J. Oliver, Deputy Director, FTC
120.	24.9.80	FSA : Oilseed lessons-Summary and questions	Th. A.N. Venkateswaran, Associate Professor Agrl Botany
121.	25.9.80	Let us find ways for prosperity	Th. A. Vedkataraman, Vice-Chancellor
122.	27.9.80	Delinting cotton seeds	Th. R. Netaji Seetharaman Assistant Director Communication Centre
123.	27.9.80	Breaking groundnut dormancy and storing	Th. S. Pondiyarajan Research Associate Communication Centre

124.	28.9.80	FSA : Oilseed lessons-Summary and questions	Th. A. N. Venkateswaran Associate Professor School of Genetics
125.	28.9.80	Farmers' Day-A documentary	Th. J. Oliver Deputy Director, FTC
126.	1.10.80	FSA : Importance of water and organisations helping	Prof. R. K. Sivanappan Dean, Agrl. Engineering
127.	4.10.80	Rice seed production and storage	Th. R. Netaji Seetharaman Assistant Director Communication Centre
128.	4.10.80	How to get credit for poultry farming	Th. S. Pandiyaraj Research Associate Communication Centre
129.	5.10.80	FSA : Importance of water and organisations helping	Prof. R. K. Sivanappan Dean, Agrl. Engineering
130.	5.10.80	Sugarcane-Seminar	Th. J. Oliver Deputy Director, FTC
131.	6.10.80	'Pai' Nursery for rice	Th. M. A. Shanmugam Agri Student
132.	6.10.80	Neem cake powder coated urea	Th. R. Sivasami Agri Student
133.	8.10.80	FSA : Water management, soil-water-plant relationship	Dr. S. Subramaniam Professor Agronomy
134.	8.10.80	Seed storage - Dilogue	Th. P. Rajendran Agri Student
135.	11.10 80	Hybrid coconut	Th. R. Netaji Seetharaman Assistant Director Communication Centre
136.	11.10.80	Coffee cultivation	Th. S. Pandiyaraj Research Associate Communication Centre
137.	12.10.80	FSA : Water management, soil-water-plant-relationship	Dr. S. Subramaniam Professor Agronomy
138.	15.10.80	FSA : Water requirement	Dr. S. Sankaran Professor and Head Agronomy

139.	15.10.80	'Pai' nursery for cotton	Th. M. Shanmugam Agri Student
140.	18.10.80	Population and economics	Th. P. Natarajan Assistant Professor Agrl. Economics
141.	18.10.80	Onion production	Dr. S. Varadarajan Associate Professor Agrl. Economics
142.	19.10.80	FSA : Water requirement	Dr. S. Sankaran Professor and Head Agronomy
143.	19.10.80	Sugarcane - Seminar	Th. J. Oliver Deputy Director, FTC
144.	22.10.80	FSA : Water management in wetlands	Dr. SP. Palaniappan Associate Professor Agronomy
145.	22.10.80	Debeaking birds	Th. V. Ganesa Raja Agri. student
146.	25 10.80	Ginger cultivation	Th. R. Netaji Seetharaman Assistant Director Communication Centre
147.	25.10.80	Contingent plan for rainfed lands	Th. K. Chandrakandan Assistant Director Communication Centre
148.	27.10.80	Delousing birds	Th. A. Chandrasekaran Agri. student
149.	29.10.80	FSA : Water management for gardenlands	Dr. T Chandrasekaran Associate Professor Agrl. Engineering
150.	1.11.80	Suitable intercropping for chilli	Th. K. Chandrakandan Assistant Director Communication Centre
151.	1.11.80	Manuring turmeric	Th. R. Netaji Seetharaman Assistant Director Communication Centre
152.	2.11.80	FSA : Water management in gardenlands	Dr. T. Chandrasekaran Associate Professor Agrl. Engineering

153.	5.11.80	FSA : Water management for orchards and gardens	Th. C.M. Bhakthavathsalu Associate Professor Horticulture
154.	8.11.80	Suitable intercrop for turmeric	Th. K. Chandrakandan Assistant Director Communication Centre
155.	8.11.80	Dishes from maize	Selvi S. Thenmozhi Communication Centre
156.	12.11.80	FSA : Irrigation and fertilizer use	Dr. T. S. Manickam Associate Professor Agrl. Chemistry
157.	13.11.80	Brackish water - Symposium	Th. S. Ramanathan Assistant Professor Agrl. Chemistry
158.	15.11 80	Early synthetic cauliflower	Th. K. Chandrakandan Assistant Director Communication Centre
159.	15.11.10	Dishes from ragi	Selvi S. Thenmozhi Communication Centre
160.	16.11.80	FSA : Irrigation and fertilizer use	Dr. T. S. Manickam Associate Professor Agrl. Chemistry
161.	19.11.80	FSA : *Qualities of irrigation* water	*Dr. V. S. Krishnamurthy* Assistant Professor Agrl. Chemistry
162.	23.11.80	,,	,,
163.	26.11.80	FSA : Water budgeting	Th. M. Kotteswaran Assistant Professor Agrl. Engineering
164.	17.11.80	Agrl. Quiz	Th. K. Chandrakandan Assistant Director Communication Centre
165.	22.11 80	Ginger	Th. R. Netaji Seetharaman Assistant Director Communication Centre
166.	29.11.80	Breaking seed dormancy of groundnut	Th. S. Pandyaraj Research Associate Communication Centre

167.	30.11.80	FSA : Water budgeting	Th. M. Kotteswaran Assistant Professor Agrl. Engineering
168.	30.11.80	Banana - Seminar	Th. J. Oliver Deputy Director, FTC
169.	1.12.80	Extension methods suitable for small farmers	Dr. A. John Knight Professor and Head Agrl. Extension
170.	3.12.80	FSA : Modern irrigation methods and devices	Prof. R. K. Sivanappan Dean Agrl. Engineering
171.	6.12.80	"Perun seeragam"	Th. R. Balakrishnan Associate Professor Horticulture
172.	6.12.80	"Vettiver"	Th. S. Syed Assistant Professor Horticulture
173.	7.12.80	FSA : Modern irrigation methods and devices	Prof. R. K. Sivanappan Dean Agrl. Engineering
174	8.12.80	New Vegetable varieties	Dr. K G. Shanmugavel Professor and Head Olericulture
175.	10.12.80	FSA : Scientific irrigation techniques	Dr. M. R. Iruthayaraj Associate Professor Agronomy
1 6.	13.12.80	"Marutham" tomato	Th. K. Chandrakandan Assistant Director Communication Centre
177.	13.12.80	Betelvine wilt	Th. R. Netaji Seetharaman Asst. Director Communication Centre
178.	14.12.80	FSA : Scientific irrigation techniques	Dr. M. R. Iruthayaraj Assoc. Professor Agronomy
179.	17.12.80	FSA: Bad effects of excess irrigation and importance of drainage	Dr. T. Chandrasekaran Assoc. Professor Agrl. Engineering

180.	20.12.80	Rice plant protection	Th. G. Balasubramanian Asst. Professor Agrl. Entomology
181.	21.12.80	FSA : Bad effects of excess irrigation and importance of drainage	Dr. T. Chandrasekaran Assoc. Professor Agrl. Engineering
182.	24.12.80	FSA : Water management in drylands	Dr. S. Subramaniam Professor Agronomy
183.	27.12.80	"Vettiver"	Th. S. Syed Asst. Professor Horticulture
184.	27.12.80	Pests of crops	Th. G. Balasubramanian Asst. Professor Agrl Entomology
185.	28.12.80	Rice and groundnut-Seminar	Dr. S. Subramaniam Professor Agronomy
186.	30.12.80	New varieties of pulses	Th. J. Oliver Deputy Director, FTC
187.	31.12.80	FSA: Water management-Summary and questions	Prof. R. K. Sivanappan Dean Agrl. Engineering
188.	4.1.81	FSA: Water management-Summary and questions	Prof. R K. Sivanappan Dean Agrl. Engineering
189.	7.1.81	FSA : Importance of fertilizers	Prof. C. K. Rajagopal Professor Agrl. Chemistry
190.	13.1.81	Ways of reducing the cost of milk production	Dr. C. A. Gopalakrishnan Professor & Head Animal Husbandry
191.	14.1.81	FSA : Nitrogenous fertilizers-I	Dr. T. S. Manickam Assoc. Professor Agrl. Chemistry
192.	14.1.81	Pongal gifts	Th. A. Venkataraman Vice - Chancellor

93.	15.1 81	Our animal wealth-Symposium	Dr. S. Marimuthu Asst. Professor Animal Husbandry
194.	18.1.81	FSA : Nitrogenous fertilizers - I	Dr. T. S. Manickam Assoc. Professor Agrl. Chemistry
195.	18.1.81	Agricultural gifts for Pongal day	Th. A. Venkataraman Vice - Chancellor
196.	21.1.81	FSA : Nitrogenous fertilizers-II	Dr. T. S. Manickam Assoc. Professor Agrl. Chemistry
197.	25.1.81	FSA : Nitrogenous fertilizers-II	Dr. T. S. Manickam Assoc. Professor Agrl. Chemistry
198.	28.1.81	FSA : Phosphatic fertilizers - I	Dr. T. S. Manickam Assoc. Professor Agrl Chemistry
199.	31.1.81	"Marutham" tomato	Dr. K. G. Shanmugavel Professor & Head Olericulture.
200.	1.2.81	FSA : Phosphatic fertilizers - I	Dr. T. S. Manickam Assoc. Professor Agrl. Chemistry
201.	4.2.81	FSA : Phosphatic fertilizers - II	Dr. T. S. Manickam Assoc. Professor Agrl. Chemistry
202.	5.2.81	Effect of manures	Dr. S. Sankaran Professor & Head Agronomy
203.	7.2.81	New varieties of Hibiscus	Th. K. Chandrakandan Asst. Director Communication Centre
204.	8.2.81	FSA : Phosphatic fertilizers - II	Dr. T. S. Manickam Assoc. Professor Agrl. Chemistry

205.	10.2 81	White-pigs rearing	Dr. M. Mookappan Asst. Professor Animal Husbandry
206.	11.2.81	FSA : Potash fertilizers	Dr. K. M. Ramanathan Professor Agrl. Chemistry
207.	14.2.81	Plant protection for grapes	Th. P. Selvaraj Asst. Professor Pomology
208.	14.2.81	Treating rice seedlings	Th. K. Chandrakandan Asst. Director Communication Centre
209.		FSA : Potash fertilizers	Dr. K. M Ramanathan Professor Agrl. Chemistry
210.	16.2.81	Microbes that fix nitrogen	Dr. G. Oblisami Professor and Head Agrl. Microbiology
211.	18.2.81	FSA : Complex and mixtures	Dr. P. Kandasamy Associate Professor Agrl. Chemistry
212.	19.2.81	Sunlight and agriculture	Th. K. R. Swaminathan Professor and Head Farm Machinery
213.	21.2.81	Control rice nematode	Th. K. Chandrakandan Assistant Director Communication Centre
214.	21.2.81	"Seemai Elanthai"	Th. M. Kulasekaran Associate Professor Horticulture
215.	22.2.81	FSA : Complex and mixtures	Dr. P. Kandasami Associate Professor Agrl. Chemistry
216.	23.2.81	Winged beans-Seminar	Th. A. Venkataraman Vice-Chancellor

217.	25 2.81	FSA : Methods and time of fertilizer application	Dr. K. Kumarasami Associate Professor Agrl. Chemistry
218.	26.2.81	Agrl. Quiz	Dr. A. John Knight Professor & Head Agrl. Extension
219.	28.2.81	Control of seed borne diseases of rice	Th. K. Chandrakandan Assistant Director Communication Centre
220.	28.2.81	Banana cultivation	Th. C. M. Bhakthavathsalu Associate Professor Horticulture
221.	1.3.81	FSA : Methods and time of fertilizer application	Dr. K. Kumarasami Associate Professor Agrl. Chemistry
222.	4.3.81	Fertilizers suitable for various soils and plants	Dr. A. Gopalasami Associate Professor Agrl. Chemistry
223.	8 3.81	Fertilizers suitable for various soils and plants	Dr. A. Gopalasami Associate Professor Agrl. Chemistry
224.	11.3.81	FSA : Importance of manuring based on soil fertility status	Dr. Rani Perumal Associate Professor Agrl Chemistry
225.	15.3.81	FSA : Importance of manuring based on soil fertility status	Dr. Rani Perumal Associate Professor Agrl. Chemistry
226.	18.3.81	FSA : Micronutrients-I	Dr. G. Ramanathan Professor Agrl. Chemistry
227.	19.3.81	Poultry farming-Symposium	Dr. C. A. Gopalakrishnan Professor & Head Animal Husbandry
228.	22.3.81	FSA : Micronutrients-I	Dr. G. Ramanathan Professor Agrl. Chemistry

229.	25.3.81	FSA : Micronutrients-II	Dr. P. Savitri Associate Professor Agrl. Chemistry
230.	25.3.81	Pests of groundnut and rice-Discussion	Th. G. Balasubramanian Assistant Professor Agrl. Entomology Th. K. Chandrakandan Assistant Director Communication Centre
231.	29.3.81	FSA : Micronutrients-II	Dr. P. Savitri Associate Professor Agrl. Chemistry
232.	30.3.81	Centenary celebration of Agriculture Department	Th. A. Venkataraman Vice-Chancellor & others

Appendix IX

LIST OF ON - GOING PROJECTS

DEPARTMENT OF AGRONOMY, COIMBATORE

R. 1. Agron.	353	Formulation of package of practices on wheat; Time of sowing on wheat
R. 1. Agron.	354	Formulation of package of practices on wneat varieties and irrigation
R. 1. Agron.	355	Studies on the possibilities of introducing wheat under wetland rotation
R. 1. Agron.	356	Varietal - cum - manurial trial on wheat
R. 1. Agron.	357	Evaluation of suitable varieties of wheat for rainfed conditions (2 centres) - Coimbatore and Kovilpatti
R. 1. Agron.	358	Formulation of package of practices on rice; Efficiency of slow release nitrogenous fertilizers in rice
R. 1. Agron.	359	Management of non-cash inputs to increase the efficiency of N at moderate levels
R. 1. Agron.	360	Spacing and manurial repuirement of hybrid cotton (Rainfed)
R. 1. Agron.	361	Plant population and nitrogen requirement of pre-release varieties of sesamum (Irrigated and rainfed)
R. 1. Agron.	362	Mixed cropping studies in sesamum (Irrigated and rainfed)
R. 1. Agron.	363	Manurial-cum-rotation experiment on cotton
R. 1. Agron.	365	N management in transplanted rice by levels, form and method of application
R. 1. Agron.	366	Studies on utility of Azolla and blue green algae
R. 1. Agron.	367	Studies on the rate of placement of urea super granules at different levels of plant population in transplanted rice.
R. 1. Agron.	368	Weed control trial for direct sown rice under puddled condition

R. 1. Agron.	369	Studies on the influence of foliar spray of plant growth substances on productivity and crop efficiency
R. 1. Agron.	370	Studies on the stubble management in low land rice culture
R. 1. Agron.	371	Assessment of wheat varieties suitable for limited irrigation conditions
R. 1. Agron.	372	Agronomic evaluation of wheat varieties for early, normal and late sown conditions
R. 1. Agron.	373	Initial evaluation trial on wheat
R. 1. Agron.	374	Uniform regional trial on (Irrigated) wheat
R. 1. Agron.	375	Uniform regional trial on (Rainfed) wheat
R. 1. Agron.	376	National trial on Wheat
R. 1. Agron.	377	Barley varietal trial
R. 1. Agron.	386	Dryland technology for best moisture conservation and efficient utilisation for sorghum
R. 1. Agron.	388	Low cost technology in ragi for yield maximisation
R. 1. Agron.	389	Response of a few early arhar genotypes to population and nutrient supply under irrigated condition
R. 1. Agron.	390	Inter cropping studies in Arhar
R. 1. Agron.	392	Evaluation of urd under rice fallows condition under different sowing time
R. 1. Agron.	393	Evaluation of urd under rice fallow condition under different population
R. 1. Agron.	394	Fertilizer economy studies on blackgram under rice fallow condition
R. 1. Agron.	395	Response of mung to different dates of sowing
R. 1. Agron.	396	Response of mung genotypes to population and phosphate levels
R. 1. Agron.	397	Fertilizer economy studies on mung under rice fallow conditions

R. 1. Agron. 398 Response of cowpea genotypes to different dates of sowing in rice fallows

R. 1. Agron. 399 Coordinated varietal trial in cowpea

R. 1. Agron. 400 Testing cowpea genotypes in saline, alkaline and sandy soil types

R. 1. Agron. 401 Response of gram to different factors of production

R. 1. Agron. 402 Fertilizer requirements of double cropping sequence including gram

R. 1. Agron. 403 Agronomy of gram production in aberrant weather condition

R. 1 Agron. 404 Apportionment of fertilizer in a cropping sequence under irrigated condition

R. 1. Agron. 405 Legumes in cropping system

R. 1. Agron. 406 Agronomic requirement of the new varieties of cotton in relation to plant density and N level

R. 1. Agron. 407 Intercropping studies in cotton

R. 1. Agron. 408 Studies on chemical termination of cotton

R 1. Agron. 409 Crop canopy studies in cotton

R. 1. Agron. 411 Inter crop of jute in sugarcane

R. 1. Agron. 412 Adaptive trials on *Hibiscus cannabinus* mesta varieties

R. 1. Agron. 413 Water management in sesamum

R. 1. Agron. 414 Foliar fertilisation of NPK on the yield of sesamum

R. 1. Agron. 415 Efficiency of bio-fertiliser application on the yield of sesamum

R. 1. Agron. 416 Determining the response of germplasm under differential management of top dressed fertilizer

R. 1. Agron. 417 Determining optimum time of sowing and optimum population with two promising varieties

R. 1. Agron. 418 Maximisation of yield in sunflower

R. 1. Agron. 419 Mixed cropping studies in sunflower

R. 1. Agron. 420 Fertility studies in sunflower variety Cerniacka-66 (Morden)

R. 1. Agron. 421 Comparative economic studies of selected competitive crops under three dates of sowing

R. 1. Agron. 422 Crop sequence studies - Sunflower in paddy fallows

R. 1. Agron. 423 Sowing date and seed rate experiment in safflower

R. 1. Agron. 424 Maximisation of yield in safflower

R. 1. Agron. 425 Studies on fertilizer requirement in safflower

R. 1. Agron. 427 Relay cropping of cotton

R. 1. Agron. 429 Simple fertilizer trials on cultivators' holdings

R. 1. Agron. 430 Agronomic experiments of cropping systems and fertilizer management

R. 1. Agron. 431 Studies on forecasting of pests and diseases

R. 1. Agron. 432 Analysis of rainfall pattern and evolving cropping systems

R. 1. Agron. 433 Evaluation of crops for mosaic weather situationr (Kharif)

DEPARTMENT OF SOIL SCIENCE AND AGRICULTURAL CHEMISTRY, COIMBATORE

R. 1. SS & AC 204 Influence of rhizosphere on the physical and chemical properties of soils

R. 1. SS & AC 222 Coordinated scheme for improvement of soil physical conditions to increase agricultural production of problematic areas

R. 1. SS & AC 223 All - India coordinated project on the assessment of the effect of fertilizer use and pest management on the changing environment under intensive cropping

R. 1. SS & AC 228 ICAR coordinated scheme for investigation on correlation of soil test with crop response.

R. 1. SS & AC 235 Soil test crop response studies with cotton

R. 1. SS & AC 242 Permanent manurial experiments

R. 1. SS & AC	**252**	Effect of continuous application of micronutrient on toxicity and residual properties of soil
R. 1. SS & AC	**264**	Potassium fertilisation on crops (G.D,R.)
R. 1. SS & AC	**265**	Studies on the depletion and efficient utilisation of nitrogen
R. 1. SS & AC	**267**	Studies on the movement and depletion of phosphorus in various soils
R. 1. SS & AC	**268**	Studies on the uptake of major and minor nutrients by vegetable crops
R. 1. SS & AC	**269**	Effect of P, K_2 and FYM on physico-cehmical properties of soil in a fixed single year two crop rotation
R. 1. SS & AC	**270**	Studies on the iron nutrition of flower crops using tracer techniques
R. 1. SS & AC	**279**	Studies on the effect of different mulches on crop growth yield and properties of soil
R. 1. SS & AC	**282**	Studies on the yield and nutrient uptake of lucerne as influenced by P and micronutrient economy
R. 1. SS & AC	**283**	Effect of bio-fertilizers in combination with micronutrients on rice yield and on nitrogen fertilization
R. 1. SS & AC	**284**	Studies on urea and sulphur application on yield of crops *in comparision with ammonium* sulphate
R. 1. SS & AC	**285**	Phosphorus nutrition of pulse crop in combination with micronutrients
R. 1. SS & AC	**286**	Influence of NPK interactions on nutrient uptake, yield and quality of chilii
R. 1. SS & AC	**287**	Studies on soil test methods and correlation with crop response with particular reference to micronutrients for common cultivated crops
R. 1. SS & AC	**288**	Studies on the influence of fertilization on the yield and quality of tomato varieties/culture
R. 1. SS & AC	**291**	Micronutrient nutrition on groundnut with special reference to soil conditions and method of application

R. 1. SS & *AC*	292	Standardisation of methods of estimation of lead
R. 1. SS & *AC*	295	Radio tracer studies on soil organic matter
R. 1. SS & *AC*	296	Influence of some pesticides on different soil types and plant relationships
R. 1. SS & *AC*	298	Studies on mobilisation of added P upon application of organic amendments
R. 1. SS & *AC*	299	Nutrition of groundnut with particular reference to secondary nutrients
R. 1. SS & *AC*	301	Diagnostic evaluation of iron deficiency and follow up recommendation for correction of iorn deficiency
R. 1. SS & *AC*	302	Studies on the effect of graded doses of micronutrients on the yield and quality of chillies
R. 1. SS & *AC*	303	Studies on the effect of different levels, method and time of applicatron of K fertilizers on cereal crops
R. 1. SS & *AC*	304	Influence of organic and inorganic fertilizers on plant growth, yield and quality of some important vegetables
R. 1. SS & *AC*	305	Studies on the effect of micronutrients on seed cotton yield and quality of fibre of different varieties grown in different agro-climatic regions
R. 1. SS & *AC*	306	Effect of applied micronutrients on growth, yield and quality of cassava
R. 1. SS & *AC*	307	Effect of interaction of nitrogen and sulphur in rice crop
R. 1. SS & *AC*	308	Effect of foliar application of K fertilizer on yield and quality of bhendi
R. 1. SS & *AC*	309	Monitoring the nutrient availability under continuous fertilization and cropping (rice)
R. 1. SS & *AC*	310	Varietal screeing for micronutrient stress
R. 1. SS & *AC*	311	Studies on micronutrient interaction in rice
R. 1. SS & *AC*	312	Effect of added organic matter on availability of macro and micronutrients in soils and crop yield
R. 1. SS & *AC*	313	Effect of growth regulators, Azotobacter and Azospirillum on performance of sesamum

S. 1. SC & *AC*	314	Studies on the pattern of nitrogen availability due to continous cropping and fertilization
R. 1. SS & *AC*	315	Coated and slow release nitrogenous fertilizers on yield and N use efficiency by rice
R. S. *SS* & *AC*	316	Effect of continous cropping on depletion of micronutrients.
R. 1. SS & *AC*	317	Delineation of regions for micronutrient deficiency.
R. 1. SS & AC	318	Studies on different sources of organic manures as micronutrient carriers and their effect on micronutrient availability
R. 1. SS & *AC*	319	Studies on comparative efficacies of different sources of micronutrients and methods of application of micronutrients under different agro-climatic regions of Tamil Nadu
R. 1. *SS* & *AC*	320	Management of excessively permeable land to increase agricultural production
R. 1. SS & *AC*	321	Studies on the improvement of physical conditions of soils having impervious layer at shallow depth
R. 1. SS & *AC*	322	Studies on the pysical properties of different soil series of Tamil Nadu and delineation of soil physical problems
R. 1. SS & *AC*	323	Studies on root growth under differenet soil management conditions
R. 1. SS & *AC*	324	Studies on the management of slow permeable soils to increaseae agricultural production
R. 1. SS & *AC*	325	Studies on the root growth and nutrient uptake under mulch farming systems
R. 1. SS & *AC*	326	Studies on the effect of depth and intensity of puddling on the yield of paddy and physical properties of soils
R. 1. SS & *AC*	327	Studies on the pattern of distribution of nutrients within the plant as a result of absorption of organic amendments and its effect on yield
R. 1. SS & *AC*	328	Study of groundwater recharge and pollution using tritiated water

DEPARTMENT OF PLANT PATHOLOGY, COIMBATORE

R. 1. Pl. Path.	227	Control of storage fungi in groundnut and cotton
R. 1. Pl. Path.	231	Varietal screening and control of diseases of greengram
R. 1. Pl. Path.	242	Seed health testing of breeder's seed and evolving methods to eliminate the pathogens from breeder's seed
R. 1. Pl. Path.	246	Studies on tomato spotted wilt
R. 1. Pl. Path.	252	Control of head moulds of sorghum
R. 1. Pl. Path.	253	Varietal screening and control of bacterial blight of cotton
R. 1. Pl. Path.	254	Varietal screening and control of root rot of cotton
R. 1. Pl. Path.	256	Control of root rot diseases of gingelly by seed treatment and soil amendment
R. 1. Pl. Path.	257	Screening for phyllody disease resistance in gingelly
R. 1. Pl. Path.	258	Evaluation of gingelly varieties for resistance to leaf spo and powdery mildew
R. 1. Pl. Path.	259	Evolving integrated method of control for sesamum diseases
R. 1 Pl. Path.	260	Control of tikka leafspot and rust diseases of groundnut
R. 1. Pl. Path	261	Screening varieties for resistance to groundnut rust disease
R. 1. Pl. Path.	262	Varietal screening for tikka leafspot and other leafspot diseases of groundnut
R. 1. Pl. Path.	263	Varietal screening and control of diseases of cowpea (root rot, dieback and other diseases of cowpea) and horsegram
R. 1. Pl. Path.	264	Studies on diseases of redgram
R. 1. Pl. Path.	265	Varietal screening and control of root rot of bengalgram
R. 1. Pl. Path.	266	Varietal screening and control of root rot and die-back disease of lab lab
R. 1. Pl. Path.	267	Varietal screening and control of tip blight and powdery mildew disease of blackgram
R. 1. Pl. Path	268	Control of virus diseases by use of inhibitors
R. 1. Pl. Path.	269	Studies on rice tungro disease

R. 1. Pl. Path.	270	Studies on sheath rot disease of rice
R. 1. Pl. Path.	271	Studies on the control of bacterial leaf blight disease of rice
R. 1. Pl. Path.	272	Control of *Alternaria* leaf spot of safflower
R. 1. Pl. Path.	275	Influence of nutrition on the incidence and development of rice tungro virus disease
R. 1. Pl. Path.	278	Eradication of seed-borne pathogens of rice and sorghum from seed
R. 1. Pl. Path.	279	Screening for disease resistance and chemical control of ragi blast
R. 1. Pl. Path.	281	Control of seed-borne pathogens of pulses
R. 1. Pl. Path.	282	Control of root rot and wilt diseases of groundnut
R. 1. Pl. Path.	283	Control of powdery mildew, dieback and cercospora leafspot of chillies
R. 1. Pl. Path.	284	Control of damping off of brinjal and tomato
R. 1 Pl. Path.	285	Control of root rot disease of jasmine
R. 1. Pl. Path.	286	Control of powdery mildew and leafspot disease of rose by newer fungicides
R. 1. Pl. Path.	287	Control of leafspot and root rot diseases of chrysanthemum
R. 1. Pl. Path.	288	Methods of detection for early identification of coconut infected by wilt disease
R. 1. Pl. Path.	289	Screening of varieties for disease resistance and control of foliar disease of sorghum
R. 1. Pl. Path.	290	Screening for disease resistance and evolving chemical control of sugary disease of sorghum
R. 1. Pl. Path.	291	Screening for disease resistance and chemical control of soybean diseases
R. 1. Pl. Path.	292	Identification of strains of rice tungro virus in Tamil Nadu
R. 1. Pl. Path.	293	Screening for disease resistance and evolving methods of control for root rot disease of sunflower
R. 1. Pl. Path.	294	Studies on endomycorrhizal association of citrus, tomato and eucalyptus and their interaction with some soil-borne plant pathogens

Rl. Ag. Ent	295	Efficacy of spray application with reference to types of applicators.
Rl. Ag. Ent	296	Evaluation of bhendi varieties for resistance to pod borer
Rl. Ag. Ent	297	Screening of plants possessing insecticidal antifeedant and harmonal activity affecting insects.
Rl. Ag. Ent	298	Development of a pest management system in rice
Rl. Ag. Ent	299	Studies on control of pests of cruciferous vegetables.
Rl. Ag. Ent	300	Studies on control of pests of onion.
Rl. Ag. Ent	301	Studies on the pests of *Azolla pinneta* and their control
Rl. Ag. Ent	302	Studies on the maintenance and development of high yielding colonies of honey bees
Rl. Ag. Ent	303	Control of sorghum shootfly and stem borer
Rl. Ag. Ent	304	Studies on the control and screening for resistance to the sorghum mite *Oligonychus indicus*

DEPARTMENT OF NEMATOLOGY, COIMBATORE

Rl. Ag. Nem.	101	Taxonomic studies on the plant parasitic nematode.
Rl. Ag. Nem.	102	Bio - ecology of nematodes
Rl. Ag. Nem.	202	Screening of nematode antagonistic plants for exploitation in control.
Rl. Ag. Nem.	203	Screening cotton for resistance to the reniform nematode
Rl. Ag. Nem.	204	Cultural and biological control of the nematode pests of vegetables
Rl. Ag. Nem.	205	Studies on the resistance in tomato to root - knot and reniform nematodes
Rl. Ag. Nem.	206	Chemical control of lesion nematodes in maize and sorghum.
Rl. Ag. Nem.	207	Studies on rice - root nematodes.
Rl. Ag. Nem.	208	Nematode parasites of betelvine.
Rl. Ag. Nem.	209	Chemical control of nematodes in cotton.
Rl. Ag. Nem.	210	Control of nematodes in turmeric.

Rl. Ag. Nem. 212 Nematode soil-borne disease complex in vegetables.

Rl. Ag. Nem. 213 Biology, pathogenecity and screening for resistance to the cyst nematode *Heterodera cajani* on redgram and blackgram.

DEPARTMENT OF SEED TECHNOLOGY, COIMBATORE

R.1.Seed Tech. 207 Studies on seed production technology in cotton.

R.1.Seed Tech. 209 Evolving suitable package of practices for the production of quality seed in blackgram and greengram.

R.1.Seed Tech. 212 Standardisation of seed production technology in gingelly.

R.1.Seed Tech. 221 Studies on the production, processing and storage of seeds of *Cenchrus ciliaris* L. (Kolukkattai grass.)

R.1.Seed Tech. 222 Studies on the production, processing and storage of seed of guinea grass

R.1.Seed Tech. 223 Studies on the production, processing and storage of seed of horsegram

R.1.Seed Tech. 224 Studies on the production, processing and storage of seeds of lucerne (*Medicago sativa* Linn)

R.1.Seed Tech. 225 Studies on the production, processing and storage of seeds of sunnhemp

R.1.Seed Tech. 226 Studies on the production, processing and storage of seed of sunnhemp

R.1.Seed Tech. 227 Studies on pre - treatment of seeds of redgram Co. 3.

R.1.Seed Tech. 228 Seed and seedling vigour in rice varieties (*Oryza sativa).*

R.1.Seed Tech. 229 Standardisation of optimum sieve size for processing

R.1.Seed Tech. 230 Storage studies in rice.

R.1.Seed Tech. 231 Determination of optimum time of sowing of parental lines in relation to time of sowing to achieve maximum synchronisation in flowering in sorghum hybrid.

R.1.Seed Tech. 232 Flowering behaviour of parental line of sorghum hybrid at different places in Coimbatore district.

R.1.Seed Tech. 233 Influence of spraying growth retardants and/or promoting substances on the growth and flowering of the parental line of sorghum hybrids and fixing the optimum dose and time of spraying for achieving synchrony in flowering.

R.1.Seed Tech. 234 *Standardisation of seed health testing techniques for the* important seed-borne pathogenes occuring in Tamil Nadu.

R.1.Seed Tech. 235 Assessment of tolerance limits in seed for important seed-borne pathogens

R.1.Seed Tech. 236 Production of blackgram seeds free of *Marcrophomina phaseolina*

DEPARTMENT OF AGRICULTURAL MICROBIOLOGY

R.1. Ag.Micro. 202 Studies on the occurrence and isolation of *Rhizobium* strains for various pulse crops from different agro-climatic regions of Tamilnadu.

R.1. Ag.Micro. 207 Interrelationship between rhizobia and forage legumes in relation to efficient nitrogen fixation.

R.1. Ag.Micro. 208 Studies on biological nitrogen fixation in millets by *Azospirillum.*

R.1. Ag.Micro. 209 Studies on the effect of *Azospirillum* inoculation on cotton.

R.1. Ag.Micro. 210 Effect of various stress conditions on the growth and nitrogen fixation by *Spirillum lipoforum.*

R.1. Ag.Micro. 213 Studies on non-symbiotic nitrogen fixation in groundnut.

R.1. Ag.Micro. 214 Studies on nitrogen fixation by blue-green algae in rice crop and rice field.

R.1. Ag.Micro. 215 Studies on *Azolla anabaena* symbiosis and nitrogen fixation under rice field condition.

R.1. Ag.Micro. 217 Studies on non-symbiotic nitrogen fixation in bhendi and amaranthus crops.

R.1. Ag.Micro. 219 Studies on the epiphytic micro-organisms in providing nitrogen nutrition to fodder grasses.

R.1. Ag.Micro. 227 Physico-chemical and biological properties of SPIC-effluent on soil micro-organisms and crop system.

R.1. Ag. Micro. 230 Studies on the effect of tannery soild wastes and effluents on soil micro-orgonisms and their activities.

R.1. Ag. Micro. 231 Treatment of tannery effluents.

R.1. Ag. Micro. 235 Microbial degradation of farm wastes for biogas generation.

R.1. Ag. Micro. 239 Survey, isolation and development of rhizohial strains for different saline and alkaline regions of Tamilnadu.

R.1. Ag. Micro. 240 Survival of salt tolerant rhizobial strains in the saline and alkaline soil and in the rhizosphere of pulse crops.

R.1. Ag. Micro. 241 Development of suitable inoculum for augmenting biogas generation.

R.1. Ag. Micro. 242 Interaction between rhizobial strains and gypsum and other ameliorative agents in saline, alkaline soils.

R.1. Ag. Micro. 243 Microbial solubilization of phosphatic compounds and interaction between phosphobacteria and rhizobial inoculants.

R.1. Ag. Micro. 244 Studies on the biological nitrogen fixation in bhendi, chillies and onion.

R.1. Ag. Micro. 245 Development of suitable carrier materials for bacteria I inoculants such as *Azospirillum* and phosphobacteria.

R.1. Ag. Micro. 246 Pesticide microflora interactions in rice ecosystem.

R.1. Ag. Micro. 248 Deodorisation and recycling of industrial organic wastes.

R.1. Ag. Micro. 249 Studies on *Rhizobium* strain interactions with greengram and bengalgram.

R.1. Ag. Micro. 250 Studies on *Rhizobium* redgram symbiosis.

R.1. Ag. Micro. 251 Studies on the symbiotic relationships of *Rhizobium* with blackgram and cowpea.

R.1. Ag. Micro. 101 Rhizobial serotypes in relation to nodulation and yield of pulses.

DEPARTMENT OF CROP PHYSIOLOGY, COIMBATORE

R.1.Pl. Physiol. 214 Investigation on the efficacy of supplementing foliar urea with basal gypsum incorporation in groundnut.

R.1.Pl.Physiol. 215	Effect of season on grain maturation in rice
R.1.Pl.Physiol. 216	Studies on certain aspects on the physiology of maturation of rice grain
R.1.Pl.Physiol. 217	Certain aspects of physiology of fiterosis in cotton (Gossypium)
R.1.Pl.Physiol. 218	Physiological basis for the performance of interspecific hybrid derivative in *Arachis* L
R.1.Pl.Physiol 219	Study on the absorption potential of P, K and S through foliar spray in greengram
R.1.Pl.Physiol 224	Efficiency of foliar fertilization in redgram
R.1.Pl.Physiol 225	Efficiency of foliar fertilization in blackgram
R.1.Pl.Physiol 226	Physiological and biochemical basis of drought tolerance in cotton
R.1.Pl.Physiol 227	Effect of deflowering in cotton
R.1.Pl.Physiol 228	Effect of bio-active water on crops
R.1.Pl.Physiol 229	Nutrient spray for pod development
R.1.Pl.Physiol 230	Pod development in intact groundnut of harvested haulms.
R.1.Pl.Physiol 231	Comparative studies on distal and proximal kernels in groundnut
R.1.Pl.Physiol 232	Standardisation of techniques for foliar diagnosis
R.1.Pl.Physiol 233	Foliar diagnosis and correction of nutritional disorders in jasmine and crossandra
R.1.Pl.Physiol 234	Foliar diagnosis and service for the nutritional and physiological disorders in important crops of the state
R.1.Pl.Physiol 235	Plant-water deficit and related physiological process in groundnut
R.1 Pl.Physiol 236	Studies on responsiveness of groundnut with reference to thermo and photosensitivity
R.1.Pl.Physiol. 237	Productive efficiency in semi-spreading types of groundnut

R.1.Pl.Physiol. 238 Physiology of induced perenniality in groundnut for seed multiplication

R.1.Pl.Physiol. 239 Root pruning in rice

R.1.Pl.Physiol. 240 Photoperiodicity in pearl millet

R.1.Pl.Physiol. 241 Nutritional disorders in forage crops

R.1.Pl.Physiol. 242 Nutritional disorders in turmeric

R.1.Pl.Physiol. 243 Induction of drought tolerance by pretreatments of seeds for dry farming

R.1.Pl.Physiol. 244 Screening of varieties and cultures of sorghum used in breeding programme for drought and salt tolerance

R.1.Pl.Physiol. 245 Sulphur nutrition in groundnut

DEPARTMENT OF BIOLOGY, COIMBATORE

R. 1. Biol. 102 Evolving 'virus free' material with the aid of tissue culture technique

R. 1. Biol. 105 Production of haploid plants by adopting anther culture in banana and other plant species

R. 1. Biol. 106 Studies on Eri silkworm

R. 1. Biol. 107 Ecology of oligochaetes in wetlands

R. 1. Biol. 108 Genetic potential of rice dwarfs

R. 1. Biol. 109 Genetic differentiation in pulses

R. 1. Biol. 110 Studies on *in vitro* symbiosis of *Rhizobium* with *Arachis* and other pulses in callus cultures

R. 1. Biol. 111 Studies on embrylogy and pollen morphology of wild and cultivated species of *Carica papaya*

R. 1. Biol. 112 Embryological studies in different wild and cultivated species of *Oryza sativa*

R. 1. Biol. 113 Studies on the seed coat inhibitors of crop plants

R. 1. Biol. 114 Biological studies on Azolla

R. 1. Biol. 201 Induction of multivoltine character in bivoltine race of mulberry silkworm

R. 1. Biol.	202	Studies on the ecology of honey bees
R. 1. Biol.	231	Effect of pollution of soil ecosystem
R. 1. Biol.	232	Seed technology of silkworm *Bombyx mori* L.
R. 1. Biol.	233	Effect of antibiotics on the growth of silkworm with special reference to diseases
R. 1. Biol.	234	Rearing of Eri silkworm on synthetic and semi-synthetic diet

DEPARTMENT OF BIOCHEMISTRY, COIMBATORE

R. 1. Biochem.	103	Biochemical and genetic studies of nitrogen fixing dacteria
R. 1. Biochem.	206	Bio-chemical studies on the nitrogen fixing fungi and algae
R. 1. Biochem.	207	Bio-chemical studies on sunflower with reference to physical and chemical charge characteristics of oil and its keeping quality
R. 1. Biochem.	208	Biochemical quality of common pulses in relation to their protein content and nutritive value
R. 1. Biochem.	209	Screening of certain genotypes in sorghum by enzyme technique
R. 1. Biochem.	211	Biochemical and enzyme variation in leaves in relation to fruit components of tomato
R. 1. Biochem.	212	Polysacharide fractionation in common tubers
R. 1. Biochem.	213	Protein fractionation in blackgram
R. 1. Biochem.	214	Biochemical properties of roots leading to susceptibility (or) resistance to nematode attack
R. 1. Biochem.	215	Screening of certain pulses varieties for efficiency of nitrogen utilization in relation to yield
R. 1. Biochem.	216	Studies on the oil content of sunflower as influenced by environmental, agronomical, varietal and genetic factors
R. 1. Biochem.	217	Studies on pungent principles in chilli varieties
R. 1. Biochem.	219	Utilization of pollutants

R. 1. Biochem. 222	Characterisation of vegetable oils from unconventional sources
R. 1. Biochem. 223	Studies on the fate of organic mattar in cultivated soils of Tamil Nadu
R. 1. Biochem. 224	Study of trypsin inhibitor in legume seeds
R. 1. Biochem. 225	Molecular and biochemical aspects of callus tisues
R. 1. Biochem. 226	Preparation of syrup from unconventional sources

DEPARTMENT OF AGRICULTURAL ECONOMICS, COIMBATORE

R.1. Ag. Econ. 202	Cost of cultivation of principal crops in Tamil Nadu
R.1. Ag. Econ. 277	Returns of investment in research and extension
R.1. Ag. Econ. 284	Farmers' expectation under risk
R.1. Ag. Econ. 291	Employment and rural poverty
R.1. Ag. Econ. 292	Evaluation of irrigation system
R.1. Ag. Econ. 293	Critical evaluation of tank irrigation
R.1. Ag. Econ. 253	Factors responsible for low standard of living of farmers in spite of considerable increase in agricultural production
R. 1. Ag. Econ. 301	Scheme for techno-economic Survey of different districts of Tamil Nadu - Ramanathapuram district

DEPARTMENT OF AGRICULTURAL BOTANY, MADURAI

R. 2. Ag. Bot. 224	Development of high yielding varieties and or hybrids of sorghum suited to rainfed tracts of Thenkasi
R. 2. Ag. Bot. 225	Physiological and biochemical aspects of drought resistance and screening genotypes and varieties of rice
R. 2. Ag. Bot. 226	Physiological and biochemical aspects of salt tolerance and screening genotypes and varieties of rice
R. 2. Ag. Bot. 227	Evaluation of brown plant hopper resistant breeding lines of riee for their yielding ability and other agronomic and quality characters
R. 2. Ag. Bot. 229	Development of saline and alkaline tolerant rice varieties suitable for southern districts with 130 - 140 days duration

R. 2. Ag. Bot. **232** Improvement of Irungu Cholam for southern districts

R. 2. Ag. Bot. **233** Evaluation of high yielding redgrained sorghum varieties.

R. 2. Ag. Bot. **234** Evaluation of high yielding rice breeding lines for 120-140 days duration with tolerance to pests and diseases

R. 2. Ag. Bot. **236** Evaluation of cotton breeding lines suitable for southern districts

R. 2. Ag. Bot. **237** Physiological and biochemical aspects of cold tolerance and screening of genotypes of rice

R. 2. Ag. Bot. **239** Evolution of high yielding pest and diseases resistant strains of rice with 100-120 days duration

R. 2. Ag. Bot. **240** Development of high yielding variety better than chittrai-kar rice in drought tolerance and suitable for southern districts

R. 2. Ag. Bot. **242** Development of high yielding non-shedding varieties of rice with 110-115 days duration suitable for kar season of Uthamapalayam Division in Periyar Vaigai Project Area

R. 2. Ag. Bot. **243** Evolving high yielding varieties of rice with 120-140 days duration having tolerance to cold weather during second season of Uthamapalayam Division in Periyar - Vaigai Project Area

R. 2. Ag. Bot. **244** Development of high yielding irrigated varieties of sor-ghum with short duration (90 days)

R. 2. Ag. Bot. **245** Development of high yielding rice varieties of 120-140 days duration suitable for the tail end of Vaigai River Project Area

R. 2. Ag. Bot. **246** Evolution of high yielding early maturing variety rice with resistance to pests and diseases

R. 2. Ag. Bot. **247** Development of high yielding rice varieties of 100 - 120 days duration suitable for first crop season

R. 2. Ag. Bot. **248** Development of high yielding rice varieties with 120-140 days duration suitable for single crop wetlands.

DEPARTMENT OF AGRONOMY, MADURAI

R. 2. Agron. (ORP)	201	Integrated weed management for paddy under Madurai conditions
R. 2. Agron. (ORP)	202	Irrigation scheduling for rice
R. 2. Agron.	236	Studies on the improvement of rice yield in II season
R. 2. Agron.	237	Jute varieties and agronomic practices for fibre production
R. 2. Agron.	238	Jute varieties and agronomic practices for seed production
R. 2. Agron.	239	Effect of various irrigation schedules on kharif crops: sunflower
R. 2. Agron.	240	Effect of moisture stress and irrigation levels on rice varieties under direct sown conditions
R. 2. Agron.	241	Studies on water use by crop growth in pure and mixed stand of crops: Cotton
R. 2. Agron.	242	Effect of moisture stress and N levels on transplanted rice varieties
R. 2. Agron	243	Irrigation studies on rice based cropping system in Periyar Vaigai command area
R. 2. Agron.	245	Effect of different legumes in cropping systems
R. 2. Agron.	246	Studies on increasing cropping intensity in single crop wetland by ratton management
R. 2. Agron.	249	Evaluation of agronomic practices for rice varieties
R. 2. Agron.	250	Use of biofertilizers in paddy
R. 2. Agron.	251	Effect of pre and post emergence herbicides in chillies
R. 2. Agron.	252	Studies on cropping pattern under rainfed condition
R. 2. Agron.	253	Effect of seed hardening treatment on rainfed sorghum
R. 2. Agron.	254	Relay cropping in double crop paddy lands
R. 2. Agron.	255	Studies on bund cropping in wetlands
R. 2. Agron.	256	Low cost technology in sugarcane
R. 2. Agron.	258	Fixing up of sugarcane varieties for early, mid and late seasons

R. 2. Agron.	259	Different methods of planting in sugarcane
R. 2. Agron.	260	Fixing optimum and economic levels of nitrogen in sugarcane
R. 2. Agron.	261	Studies on seasonal influence on the performance of soghum varieties and hybrids to transplanting under Madurai conditions
R. 2. Agron.	262	Performance of high yielding paddy strains in double cropped areas of Periyar-Vaigai Project
R. 2. Agron.	263	Study of critical stages of irrigation for ratoon sorghum (Co. 23)
R. 2. Agron.	264	Studies on scheduling irrigation at different growth stages and its influence on the growth and yield of groundnut
R. 2. Agron.	265	Studies on the residual effect of P and K on rice-rice cropping system
R. 2. Agron.	266	Studies on the residual effect of P and K on single cropping (Rice) systems
R. 2. Agron.	267	Studies on the comparative performance of ammonium chloride as a source of N and its effect on soil fertility

DEPARTMENT OF SOIL SCIENCE & AGRL. CHEMISTRY, MADURAI.

R. 2. SS & AC. 210	Studies on soil water movement under different irrigation regimes
R. 2. SS & AC. 211	Permanent manurial experiments on rice
R. 2. SS & AC. 21?	Studies on the quality of irrigation water of southern districts of Tamil Nadu
R. 2. SS & AC. 213	Studies on the mineralization of preincubated urea and slow acting urea on rice crop
R. 2. SS & AC. 216	Influence of sulphur fertilization on the yield of maize and paddy and their quality
R. 2. SS & AC. 217	Studies on the effect of cholam and cumbu crops on the succeeding cotton crop
R. 2. SS & AC. 218	Soil test-crop response correlation studies on rice
R. 2. SS & AC. 219	Studies oe the various fertilizer effect on the yield and capsicine content in chillies

R. 2. SS & *AC.* 220	Studies on the fertilizer response in direct sown rice under semi-dry condition
R. 2. SS & *AC.* 222	Studies on the use of coal ash in improving the physico-chemical propertics of soils
R. 2. SS & *AC.* 223	Studies on the interaction of micro-nutrients on paddy soils
R. 2. SS & *AC.* 224	Studies on the influence of coir pith as an amendment for the reclamation of problem soils and on the improvement of physico-chemical properties of soils
R. 2. SS & *AC.* 225	Studies on increasing the solubility of rock phosphate and on its residual effect
R. 2. SS & *AC.* 226	Studies on the fertilizer requirments of cardamom
R. 2. SS & *AC.* 229	Soil test-crop response correlarion studies on sorghum
R. 2. SS & *AC.* 230	Soil test-crop response correlation studies on ragi
R. 2. SS & *AC.* 231	Studies on the improvement of percolation rate of water in the less permeable soils of Periyar Vaigai Command Area
R. 2. SS & *AC.* 232	Evaluation of moisture retention and release characteristics of different soil series in Periyar Vaigai Project Command Area
R. P. SS & *AC.* 233	Studies on the nutrient uptake pattern under different irrigation regimes
R. 2. SS & *AC.* 234	Studies on the movement of major nutrients under different irrigation regimes
R. 2. SS & *AC.* 235	Studies on the utilization of coir pith as manure for agricultural crops
R. 2. SS & *AC.* 236	Study of nutrient content of green vegetables by using sewage water of Madurai city

DEPARTMENT OF PLANT PATHOLOGY, MADURAI.

R. 2. Pl. Path. 210	Investigations of chilli mosaic
R. 2. Pl. Path. 214	Studies on root rot and collar rot diseases of groundnut

R. 2. Pl. Path.	217	Studies on the control of rust and tikka leaf spot in groundnut.
R. 2. Pl. Path.	218	Studies on ecology and control of sheath blight, sheath rot and other similar symptoms causing organisms of rice.
R. 2. Pl. Path.	219	Studies on varietal resistance in rose to powdery mildew and blackspot diseases and their control.
R. 2. Pl. Path.	221	Management of leaf spot (Sigatoka) disease of banana.
R. 2. Pl. Path.	222	Culturing of *Pleurotus sp.* mushroom under high temperature conditions.
R. 2. Pl. Path.	223	Eqidemiology, varietal screening and control of fungal and bacterial diseases of sugarcane
R. 2. Pl. Path.	224	Studies on the prevalence of virus diseases ; Isolation of virus free material
R. 2. Pl. Path.	225	Selection of suitable rice varieties resistant to tungro for southern districts

DEPARTMENT OF AGRL. ENTOMOLOGY, MADURAI

R. 2. Ag. Ent.	214	Integrated control of *Spodoptera litura* on cotton
R. 2. Ag. Ent.	216	Studies on antifeedants on the control of insects
R. 2. Ag. Ent.	224	Studies on the integrated control of pests of chillies
R. 2. Ag. Ent.	227	Integrated control of redpalm weevil, rhinoceros beetle and blackheaded caterpillar
R. 2. Ag. Ent.	229	Studies on the pest management in mixed cropping system in dry and garden lands
R. 2. Ag. Ent.	230	Studies on the effect of pesticides and their adjuvants on the germination of pollen grains and fruit/seed set in important crop plants
R. 2. Ag. Ent.	232	Integrated control of cotton bollworms
R. 2. Ag. Ent.	234	Studies on the resistance in chillies to thrips, aphids and mites
R. 2. Ag. Ent.	235	Studies on the effect of fertilizers on the efficacy of pesticides in the control of sucking pests

R. 2. Ag. Ent.	236	Evaluation of insecticides for their relative toxicity to parasites add predators
R. 2. Ag. Ent.	237	Studies on the efficacy of light traps, water traps and sticky traps in pest forewarning and control
R. 2. Ag. Ent.	238	Studies on the economic theresholds of gallmidge, leaf folder and whorl maggot
R. 2. Ag. Ent.	239	Evaluation, standardisation and formulation of the NPV of *Spodoptera litura*
R. 2. Ag. Ent.	240	Evaluation, standardisation and formulation of NPV of *Amsacta albistriga*
R. 2. Ag. Ent.	241	Evaluation, standardisation and formulation of the white halo fungus, *Cephalosporium lecnii*
R. 2. Ag. Ent.	242	Integrated pest management in rice
R. 2. Ag. Ent.	243	Control of rootknot nematode on bhendi through seed treatment
R. 2. Ag. Ent.	244	Bioecology and control of sugarcane stemborers, mealy bugs and pyrilla
R. 2. Ag. Ent.	245	Control of nematode parasites of grapevine
R. 2. Ag. Ent.	246	Development of insecticide application techniques in rice for effective insect control and conservation of natural enemies
R. 2. Ag. Ent.	247	Studies on the potentiality of predators and parasites in the control of rice leaf and planthoppers
R. 2. Ag. Ent.	249	Integrated control of *Spodoptera litura* on chillies
R. 2. Ag. Ent.	250	A survey on the naturally occurring parasites, predators and pathogens of *Spcdoptera litura*
R. 2. R. B.	201	Breeding rice varieties resistant to gall midge
R. 2. Ag. Ent. (ORP)	201	Operational Research Project on the control of blackheaded caterpillar of coconut

DEPARTMENT OF HOME SCIENCE, MADURAI

R. 2. H. Sc.	201	Improving the shelf life of important commercial vegetables

R. 2. H. Sc.	202	Studies on the development of ready-to-use foods from rice
R. 2. H. Sc.	203	Studies on the characteristics of rice varieties suitable for conventional products like aval and pori
R. 2. H. Sc.	204	Housewives' views and knowledge on labour saving devices
R. 2. H. Sc.	205	Study of the existing sources of energy and their effective utilization at households and hostels
R. 2. H. Sc.	206	Effect of reorganisation and nutrition education in the existing pre-scool at AC & RI., Madurai

DEPARTMENT OF AGRICULTURAL ECONOMICS, MADURAI

R. 2. Ag. Econ.	209	A study on economics of production and marketing of tomato in Madurai district
R. 2. Ag. Econ.	210	A study on the problems of producion and marketing of vegetable with reference to brinjal & onion
R. 2. Ag. Econ.	212	Problems in production and marketing of country pear in Kodaikanal, Madurai district

DEPARTMENT OF AGRL. EXTENSION & RURAL SOCIOLOGY

R. 2. Ag. Extn.	214	Factors associated with the acceptance of TNAU paddy and cholam varieties
R. 2. Ag. Extn.	215	Diffusion of new technology and higher productivity vis-a-vis levels of living of farm families in Periyar-Vaigai region
R. 2. Ag. Extn.	217	Factors responsible for variations in paddy yield within the same system of Periyar-Vaigai irrigation project
R. 2. Ag. Extn.	218	Study of trends in fertilizer consumption

DEPARTMENT OF BIOLOGY, MADURAI

R. 2. Biol.	216	Screening of varieties of redgram, blackgram and greengram for quality attributes
R. 2. Biol.	218	Studies on certain biochemical constitutents in rice varieties in relation to harvest, storage and processing methods

R. 2. Biol.	221	Influence of South Indian earthwarm *Megascolex mauritti* on fertility status of soil under different environmental conditions
R. 2. Biol.	222	Effect of different feeds on fish growth
R. 2. Biol.	223	Isolation and identification of nitrogen fixing microorganisms suitable for crops under rainfed conditions
R. 2. Biol.	224	Effect of single and continued inoculation of symbiotic, associative symbiatic and non-symbiotic nitrogen fixers on yield of crops under dry farming systems.

DEPARTMENT OF AGRL. ENGINEERING, MADURAI

R. 2. Ag Engg.	201	Evolution of irrigation methods for different horticultural crops
R. 2. Ag. Engg.	203	Moisture conservation methods for dry farming
R. 2. Ag. Engg.	210	Design and development of a manually operated centrifugal sprayer.
R. 2. Ag. Engg.	211	Design and development of a fish descaling unit
R. 2. Ag. Engg.	212	To study and develop the design criteria for spot application of fertilisers and pesticides
R. 2. Ag. Engg.	213	To study different irrigation efficiencies in sprinkler irrigation
R. 2. Ag. Engg.	214	Design development of equipment for spot application of fertilizers and pesticides.
R. 2. Ag Engg.	215	Effect of drift of agro-chemicals used in different spraying systems

AGRICULTURAL RESEARCH STATION, BHAVANISAGAR.

R. 3. Ag. Bot.	201	Evolution of high yielding pest and disease resistant strains of rice of 100-120 days durations.
R. 3. Ag. Bot.	202	Evolution of improved strains of rice of 120-140 days duration combining high yield and resistance to major pests and diseases.
R. 3. Ag. Bot.	203	Evolution and selection of promissing cultures in sorghum, maize and other millets.

R. 3. Ag. Bot.	204	Evolution of early maturing and high yielding groundnut strains suited for LBP area for irrigated and rainfed conditions.
R. 3. Ag. Bot.	208	Varietal renovation for the production of super elite and elite sunflower seeds.
R. 3. Ag. Bot.	210	Testing promissing cultures of fibre crops viz, cotton, jute and mesta for LBP area
R. 3. Ag. Bot.	211	Development of new superior population in K2 sunflower.
R. 3. Ag. Bot.	212	Evaluation and selection of promising cultures of gingelly and castor
R. 3. Ag. Bot.	215	Evaluation and selection of promising cultures in pulses.
R. 3. Ag. Bot.	216	Development of high yielding synthetic varieties of cumbu
R. 3. Ag. Bot.	217	Evaluation and testing of promising cultures and hybrids in sunflower.
R. 3. Ag. Bot.	218	Development of inbredlines and production of composites and synthetics in sunflower.
R. 3. Ag. Bot.	219	Evaluation and selection of fodder grasses and legumes suitable for LBP area.

AGRONOMY

R. 3. Agron.	229	Long range effect of continuous cropping and manuring.
R. 3. Agron.	234	Operational research project in the farmers' field.
R. 3. Agron.	235	Effect of various irrigation schedules and phosphorus levels on groundnut and sunflower.
R. 3. Agron.	236	Studies on water use by sorghum grown in pure and mixed stands.
R. 3. Agron.	237	Studies on the effect of growth regulators on pulses.
R. 3. Agron.	238	Studies on the effect of various irrigation schedules on yield of pulse crops.
R. 3. Agron.	239	Testing tobacco varieties for their suitability to LBP area.

R. 3. Agron.	**240**	Studies on yield potential of sugarcane varieties for LBP area.
R. 3. Agron.	241	Fixing irrigation and N and P requirement of sunflower (Morden)
R. 3. Agron.	242	Water use efficiency of turmeric crop.
R. 3. Agron.	243	Effect of microbial culture for seed treatment of gingelly in saving nitrogen.
R. 3. Agron.	244	Topping-cum-varietal trial on tobacco.
R. 3. Agron.	245	Effect of N and plant density and graded levels of NPK on tobacco.
R. 3. Agron.	246	Pre-sowing hardening of gingelly seeds to improve the yield potential in rainfed areas.
R. 3. Agron.	248	Studies on water use by cotton grown in pure and mixed stands.
R. 3. Agron.	249	Studies on the effect of various irrigation regimes and fertilizer levels on growth and yield of sugarcane.
R. 3. Agron.	250	Studies on the effect of various irrigation schedules and phosphorus levels on soybean Co 1.
R. 3. Agron.	251	Studies on the effect of various irrigation schedules on sesamum.
R. 3. Agron.	252	Production potential experiment.
R. 3. Agron.	253	Nitrogen economy through organic manures.
R. 3. Agron.	254	Agronomic evaluation of new promising pre - release varieties / hybrids of Jowar.
R. 3. Agron.	257	Phospal as a source of phosphorus in relation to super phosphate in Intensive crop rotation.
R. 3. Agron.	259	Studies on the slow release nitrogen fertilizers and briquette urea on the yield of rice.

SOIL SCIENCE AND AGRICULTURAL CHEMISTRY

R. 3. SS & AC	204	Quality and quantity of oil in sunflower as influenced by the climatic factors.

R. 3. SS & AC	205	Studies on the keeping quality of sunflower oil.
R. 3. SS & AC	206	Nutrient removal by sunflower and its effect on the succeeding crop.
R. 3. SS & AC	208	Study of soil mulches on moisture conservation, nutrient availability and movement in the soil.
R. 3. SS & AC	209	Studies on crusting of soil and methods of preventing crusting.
R. 3. SS & AC	210	Studies on the sub-soil compaction to find out the threshold of bulk density of different crops.
R. 3. SS & AC	211	Effect of different levels of irrigation on the movement and availability of zinc.
R. 3. SS & AC	212	Studies on soil water movement under different irrigation regimes.
R. 3. SS & AC	213	Effect of different levels of irrigation and phosphorus on the availability of nutrients, root distribution and yield of sorghum, lab - lab and tomato.
R. 3. SS & AC	214	Effect of Mg and S on the uptake of nutrients, quality and yield of oil in sunflower.
R. 3. SS & AC	215	Evaluation of moisture release and retention characteristics of the LBP area soils.
R. 3. SS & AC	216	Effect of different levels of irrigation and phosphorus on the availability of nutrients, root distribution and yield of soybean.
R. 3. SS & AC	217	Study on the soil moisture utilisation and uptake of nutrients in relation to irrigation application in intercropped cotton.
R. 3. SS & AC	218	Study on the effect of compaction on the physical properties of coarse textured soils of the LBP ayacut and yield of sorghum, bajra and groundnut.
R. 3. SS & AC	222	Potash fertilization of crops GDR Project - Bhavanisagar centre.
R. 3. Ag. Nem.	201	Chemical control of root-knot nematode in tomato, brinjal and chillies.

R. 3. Ag. Nem. 202 Biology of root - knot nematode

R. 3. Ag. Nem. 203 Chemical control of tobacco root-knot nematode.

SEED TECHNOLOGY

R. 3. Seed Tech. 202 Seed viability methods of storage of sunflower seeds.

R 3. Seed Tech. 203 Standardisation of post-harvest technology of sunflower.

R. 3. Seed Tech. 204 Studies on standardisation of seed production and seed storage techniques in tomato.

R. 3 Seed Tech. 205 Studies on seed production and seed storage techniques in radish.

R. 3. Seed Tech. 206 Standardising quality seed production and seed storage techniques in cucurbits.

R. 3. Seed Tech. 207 Determination of package of practices for seed production and storage in amaranthus.

R. 3. Seed Tech. 208 Studies on standardisation of seed production and seed storage in bhendi.

R. 3. Seed Tech. 209 Standardisation of seed production technology and storage techniques in dolichos.

R. 3. Seed Tech. 210 Evolving suitable techniques for the production and storage of seeds in brinjal.

R. 3. Seed Tech. 211 Evolving suitable package of practices for quality seed production and storage in chillies.

R. 3. Seed Tech. 212 Time of sowing in relation to quality of sunflower seeds.

R. 3. Seed Tech. 213 Pre-soaking and foliar application of chemicals and nutrients in relation to seed production potential and quality of sunflower.

R. 3. Seed Tecn. 214 Standardisation of seed production technology and storage techniques in annual moringa.

R. 3. Seed Tech. 215 Standardising quality seed production and seed storage techiques in cowpea.

HORTICULTURE

R. 3. Hort. 201 Improvement of muskmelon and watermelon through selection and breeding.

R. 3. Hort.	206	Fertilizer studies in banana variety dwarf cavendish.
R. 3. Hort.	207	Studies on ratooning in banana dwarf cavendish and robusta.
R. 3. Hort.	208	Improvement of turmeric through selection.
R. 3. Hort.	209	Seasonal influence on turmeric under Bhavanisagar conditions
R. 3. Hort.	210	Studies on different systems of planting under LBP area.
R. 3. Hort.	211	Studies on agro - techniques in turmeric with special reference ts use of nitrogen fertilisation in LBP area.

AGRICULTURAL RESEARCH STATION, ALIYARNAGAR

AGRICULTURAL BOTANY

R. 4. Ag. Bot.	101	Evaluation of germplasm in groundnut.
R. 4. Ag. Bot. (AICORPO)	201	Screening of elite bunch groundnut selections for adaptability and stability performances.
R. 4. Ag. Bot.	202	Exploitation of variability realised through intervarietal matings in the genetic improvement of bunch groundnuts.
R. 4. Ag. Bot.	203	Evolution of superior bunch groundnut by exploiting induced mutagenesis.
R. 4. Ag. Bot.	204	Evaluation of breeding meterials of groundnut in off - season nursery for population build.
R. 4. Ag. Bot.	205	Evaluation of promising semi-spreading groundnut varieties and selections for their performance.
R. 4. Ag. Bot.	206	Development of bunch groundnut combining improved yield aud reistance to diseases.
R. 4. Ag. Bot.	207	Evolution of short duration bunch groundnuts.
R. 4. Ag. Bot.	208	Screening of rice varieties for high yield with 100 - 120 days duration,

ENTOMOLOGY

R. 4. Ent.	201	Insecticidal schedule for the control of major insect pests occuring on groundnut in Pollachi tract.

R. 4. Ent.	202	Cropping systems entomology (Groundnut based)
R. 4. Ent.	203	Studies on the vector-virus relationship and the control of budnecrosis virus of groundnut.
R. 4. Ent.	204	Screening groundnut germplasm and promising breeding materials for resistance against insect pests.

PLANT PATHOLOGY

R. 4. Pl. Path.	201	Fungicidal schedule for the control of major diseases of groundnut occurring in Pollachi tract.
R. 4. Pl. Path.	203	Screening of groundnut varieties for resistance to tikka leaf spot and rust diseases.

AGRONOMY

R. 4. Agron.	207	Study on the cropping pattern for gardenland area of Pollachi tract.
R. 4. Agron.	208	Study on the cropping pattern for wetland condition (PAP area)
R. 4. Agron.	209	Constraints in crop management and their effect on groundnut yield
R. 4. Agron.	212	Effect of irrigation regimes under different crop densities in soybean.
R. 4. Agron.	216	Vegetable based cropping system for Parambikulam Aliyar Project tract
R. 4. Agron.	217	Efficacy of biofertilizers on nitrogen management in rice crop
R. 4. Agron. (ORP.)	201	Study on low-cost technology-cum-demonstration on groundnut
R. 4. Agron. (OPP.)	202	Study on low-cost technology-cum-demonstration in paddy
R. 4. Agron. (ORP.)	203	Study on low-cost technology-cum-demonstration in cotton
R. 4 Agron. (ORP.)	204	Study on low-cost technology-cum-demonstration for sorghum
R. 4. Agron. (ORP.)	205	Integrated weed control in groundnut

REGIONAL RESEARCH STATION, PAIYUR

AGRICULTURAL BOTANY

R. 8. Ag. Bot.	202	Evolution of high yielding varieties of rice resistant to adverse soil conditions
R. 8. Ag. Bot.	203	Evolution of high yielding ragi strains suitable for rainfed tract of Dharmapuri district
R. 8. Ag. Bot.	204	Developing high yielding short duration compact type of redgram suitable for rainfed cultivation
R. 8. Ag. Bot.	205	Development of high yielding greengram, blackgram and soybean varieties suitable for rainfed areas and rice fallows in Dharmapuri district
R. 8. Ag. Bot.	206	Evolution of short duration high yielding strain of sorghum with good grain and fodder suitable for irrigated and rainfed areas
R. 8. Ag. Bot.	207	Identification of suitable variety of groundnut for growing under rainfed conditions
R. 8. Ag. Bot.	208	Breeding for a short duration variety of cotton with medium staple and tolerance to drought for the harsh ecological zone of Tamil Nadu
R. 8. Ag. Bot.	210	Evaluation of high yielding and pest and diseases resistant strains of rice of 100-120 days duration
R. 8. Ag. Bot.	211	Evaluation of improved strains of rice of 120-140 days duration combining high yield potential and resistance to major pests and diseases
R. 8. Ag. Bot.	212	Evolution of high yielding strains of rice of 140-160 days duration, resistant to major pests and diseases
R. 8. Ag. Bot.	213	Improvement of long duration varieties of rice (160 days and above) for high yield and resistance to pests and diseases
R. 8. Ag. Bot.	214	Breeding rice varieties for resistance to temperature both high and low.
R. 8. Ag. Bot.	215	Evolution of bajra strains suitable for Dharmapuri tract
R. 8. Ag. Bot.	216	Evolution of varagu and samai suitable for Dharmapuri tract

R. 8. Ag. Bot.	217	Evolving of high yielding horsegram variety to replce the local varieties
R. 8. Ag. Bot.	221	Evaluation of high yielding short duration drought tolerant varieties of cowpea and lab-lab for rainfed area in Dharmapuri district
R. 8. Ag. Bot.	222	Evaluation of varieties with suitable plant types of red-gram, blackgram, greengram, lab-lab and cowpea for bund cropping

AGRONOMY

R. 8. Agron.	208	Formulation of packages of practices for rainfed cotton in Dharmapuri district
R. 8. Agron	213	Demonstration of recommended practices and appropriate technology practices in rice
R. 8. Agron.	214	Demonstration of recommended practices and appropriate technology practices in rainfed and irrigated groundnut and sorghum
R. 8. Agron.	215	Manurial trial on ragi to fix economical does of N, P and K,
R. 8. Agron.	216	Formulation of dry farming techniques for obtaining maximum production and income
R. 8. Agron.	217	Studies on multiple and relay cropping under wetland conditions
R. 8. Agron.	218	Studies on the multiple and relay cropping under wetland conditions
R. 8. Agron.	219	Response of groundnut to phosphorus
R. 8. Agron.	221	Skipping basal application of fertilizers in rainfed sorghum
R. 8. Agron.	223	Experiment on the efficiency of azotobacter on rainfed cotton
R. 8. Agron.	224	Studies on multiple and relay cropping under gardenland conditions
R. 8. Agron.	225	Experiment to assess the efficiency of slow release fertilizers on rainfed cotton

SOIL SCIENCE AND AGRICULTURAL CHEMISTRY

R. 8. SS & AC. 201	Response of certain crops to potash fertilization
R. 8. SS & AC. 202	Studies on chlorosis in groundnut crops in Dharmapuri district
R. 8. SS & AC. 203	Effect of pre-sowing seed treatment and spraying of chemicals on rice under saline conditions
R. 8. SS & AC. 204	Studies on the susceptibility of different rice varieties to salt stress
R. 8. SS & AC. 207	Assessment of fertility status and physicochemical properties of the farm soils of Regional Research Station, Paiyur and to prepare a fertility map

PLANT PATHOLOGY

R. 8. Pl. Path. 201	Screening of rice varieties for all important rice diseases
R. 8. Pl. Path. 203	Screening of all pulse varieties (redgram, blackgram and greengram) and types for concurrent assessment of their disease resistance and evaluation
R. 8. Pl. Path. 204	Screening of all the rainfed cotton varieties grown at the Regional Research Station, Paiyur and evaluation of their field resistance to black arm and other diseases and also to evolve suitable control measures

AGRICULTURAL ENTOMOLOGY

R. 8. Ag. Ent. 201	Studies on ecology and need based chemical control of rice pests
R. 8. Ag. Ent. 202	Control of sap feeding insects on dry cotton by seed treatment and soil application of pesticides

TAMIL NADU RICE RESEARCH INSTITUTE, ADUTHURAI

AGRONOMY

R. 9. Agron. 212	Effect of time of application of P to lowland rice
R. 9. Agron. 214	Studies on geometry of placement of urea super granules at different levels of plant population in transplanted rice
R. 9. Agron. 215	Studies on the utility of azolla and blue-green algae and azolla for wetland rice culture

R. 9. Agron.	216	Fertilizer management (P & K) for rice-based cropping system
R. 9. Agron.	217	Studies on rice fallow croppings
R. 9. Agron.	218	Trial on date and maturity of cotton in rice fallows
R. 9. Agron.	219	Studies on rice-based cropping systems
R. 9. Agron.	220	Studies on the effect of straw application on wetland rice

AGRICULTURAL BOTANY

R. 9. Ag. Bot.	205	Breeding high yielding long duration rice varieties of 160 days and above with tolerance to pests and diseases suitable for samba season in Tanjavur district
R. 9. Ag. Bot.	206	Breeding high yielding varieties of rice resistant to adverse soil conditions
R 9. Ag. Bot.	207	Breeding short duration rice varieties possessing brown plant hopper resistance
R. 9. Ag. Bot.	208	Breeding rice varieties possessing resistance to tungro
R. 9. Ag Bot.	209	Evolution of pulse germplasm for rice fallows
R. 9. Ag. Bot.	210	Genetic evaluation and utilisation of available rice germplasm for resistance breeding
R. 9. Ag. Bot.	211	Development of rice varieties with high yield potential through induced mutagenesis

CROP PHYSIOLOGY

R.9.Pl.Physiol.	202	Physiological studies on the effect of kuruvai crop residue on the growth and yield of thaladi rice
R.9.Pl.Physiol.	203	Physiological effects of water logged conditions on the yield of thaladi rice

AGRICULTURAL ENTOMOLOGY

R. 9. Ag. Ent.	203	Seedlings dip experiment for control of rice pests
R. 9. Ag. Ent.	209	Assessment of losses to rice by rats
R. 9. Ag. Ent.	210	Standardising the methods to assess the population of rats in rice ecosystem

R. 9. Ag. Ent.	211	Formulation of suitable methods of rodent pest management
R. 9. Ag. Ent.	214	Economic insect pest control trial for evolving a cheap schedule of treatment
R. 9. Ag. Ent	215	New insecticide trial
R. 9. Ag. Ent.	216	Brown planthopper control
R. 9. Ag. Ent.	217	Studies on cultural methods of pest management in rice
R. 9. Ag. Ent.	218	Studies on population dynamics and control of greenleaf hopper in relation to tungro disease
R. 9. Ag. Ent.	219	Pest management is rice fallow cotton and pulses
R. 9. Ag. Ent.	220	Varietal screening for resistance to gall midge, stem borer, brown planthopper, whorlmaggot and leaf folder
R. 9. Ag. Ent.	221	Pest management in rice
R. 9. Ag. Ent.	222	Insecticidal evaluation against major pests of rice
R. 9. Ag. Ent.	223	Studies on the effect of insecticides on natural enemies of rice pests
R. 9. Ag. Ent.	224	Breeding rice varieties resistant to leaf folder

PLANT PATHOLOGY

R. 9. Pl. Path.	201	Varietal screening for bacterial leaf blight during kuruvai season
R. 9. Pl. Path.	203	Varietial screening for blast during thaladi season
R. 9. Pl. Path.	206	Screening of rice varieties and cultures for resistance to virus disease
R. 9. Pl. Path.	209	Chemical control of sheath rot disease of rice
R. 9. Pl. Path.	210	Chemical control of helminthosporiose of rice
R. 9. Pl. Path.	211	Control of tungro disease by insecticidal treatment on the vector during kuruvai and thaladi seasons
R. 9. R. Bot.	201	Breeding for resistance to bacterial leaf blight and helminthosporiose

R. 9. Pl. Path.	212	Identification of sources of resistance and their utilisation in breeding for varieties resistant to tungro disease
R. 9. Pl. Path.	213	Epidemiology of virus diseases of rice

SOIL SCIENCE AND AGRICULTURAL CHEMISTRY

R. 9. SS & AC.	203	Effect of coal tar treated urea on the yield of lowland rice

AGRICULTURAL MICROBIOLOGY

R.9.Ag.Micro.	201	Studies on nitrogen fixation and nodulation on greengram, blackgram and soybean in the rice-fallows of Thanjavur delta

AGRICULTURAL EXTENSION

R. 9. Ag. Extn.	245	Organising adaptive research trials in farmers' holdings for introducing new pulses and formulating appropriate production technologies in the divisions of Thanjavur and Pattukottai
R. 9. Ag. Extn.	246	Imparting tiaining to the farmers on the improved production technologies in the divisions of Thanjavur and Pattukottai
R. 9. Ag. Extn.	247	Organising adaptive research trials in farmers' holdings for introducing new pulses and formulating appropriate productien technologies in the divisions of Kumbakonam and Mayuram
R. 9. Ag. Extn.	248	Imparting training to the farmers on the imporved production technologies in the divisions of Kumbakonam and Mayuram
R. 9. Ag. Extn.	249	Organising adaptive research trials in farmers' holdings for introducing new pulses and formulating appropriate production technologies in the divisions of Mannargudi and Nagapattinam
R. 9. Ag. Extn.	250	Imparting training to the farmers on the improved production technologies on the divisions of Mannargudi and Nagapattinam

COCONUT RESEARCH STATION, VEPPANKULAM

AGRICULTURAL BOTANY

R. 10 Ag. Bot.	202	Progeny study in coconut

R. 10. Ag. Bot. 203	Study of semitall types of coconut from Kanyakumari
R. 10. Ag. Bot. 207	Evaluation and maintenance of coconut germplasm and varieties
R. 10. Ag. Bot. 208	Study of inter and intra varietal hybrids in coconut
R. 10. Ag. Bot. 209	Determination of oil content of coconut varieties and hybrids
R. 10. Ag. Bot. 210	Determination of husknut ration in four varieties of coconut
R. 10. Ag. Bot. 211	Character association of yield with type of phyllotaxy of leaves, length of petiole and number of leaflets in coconut

AGRONOMY

R. 10. Agron. 201	Spacing-cum-manuring trial in relation to root development
R. 10. Agron. 203	Studies on the effect of manuring, irrigation and intercultivation on the growth and yield of coconut
R. 10. Agron. 205	Studies on the intercropping in coconut (inter and mixed cropping trials)
R. 10. Agron. 206	Study of seasonal variation in flower production and yield of coconut
R. 10. Agron. 207	Studies on the effect of major nutrients on east coast tall variety (NPK fertilizer experiment on major soil types in different agro-climatic regions on ordinary tall variety of coconut)
R. 10. Agron. 208	Irrigation-cum-fertilizer experiment in coconut
R. 10. Agron. 209	Studies on the effect of summer irrigation of coconut
R. 10. Agron. 211	Intercultivation versus weed control with herbicides in adult bearing plantation
R. 10. Agron. 212	Efficiency of different soil moisture conservation measures
R. 10. Agron. 213	Application of organic and inorganic manures alone and in combination
R. 10. Agron. 214	Effect of potash application on East Coast Tall variety with special reference to copra content and barren nuts

SOIL SCIENCE & AGRL. CHEMISTRY

R.10.SS & AC. 201	Response of coconut to micronutrients with reference to zinc and copper

CROP PHYSIOLOGY

R.10.Pl.Physiol. 201	Studies on the physiological causes of button shedding in coconut

PLANT PATHOLOGY

R. 10. Pl. Path. 201	Studies on the etiology, epidemiology and survey of Thanjavur wilt of coconut
R. 10. Pl. Path. 202	Chemical control of Thanjavur wilt of coconut
R. 10. Pl. Path. 203	Effect of fertilizer and organic manures on the development of Thanjavur wilt
R. 10. Pl. Path. 205	Control of Thanjavur wilt disease using antagonistic micro-organism
R. 10. Pl. Path. 206	Control of Pencil point disease of coconut
R. 10. Pl. Path. 207	Pathogenicity of Ganoderma Lucidum on coconut

COORDINATED RESEARCH PROJECT ON SUGARCANE, CUDDALORE

AGRONOMY

R. 13. Agron.	207	Evaluation of short duration Commercial varieties of Sugarcane
R. 13. Agron.	209	Studies of sugarcane-based cropping system
R. 13. Agron	210	Sheath moisture studies
R. 13. Agron.	211	Studies on cropping intensity in sugarcane
R. 13. Agron.	212	Control of premonsoon damage to crop by shoot borers
R. 13. Agron.	213	Varieties X Planting X Harvesting interactions
R. 13. Agron.	214	Testing and field evaluation of working of II SR Tractor drawn stubble shaver
R. 13. Agron.	216	Influence of climate on ontogenic charges in factors determining evapotranspiration and biomass production in sugarcane

AGRICULTURAL BOTANY

R. 13. Ag. Bot. 201 Studies on early, mid and late season varieties of sugar-cane

R. 13. Ag. Bot. 202 Evolution of sugarcane varieties better than Co. 6304 and Co C 671

REGIONAL RESEARCH STATION, VRIDHACHALAM

AGRICULTURAL BOTANY

R. 14. Ag. Bot. 201 Evaluation of elite breeding material in spreading and semispreading groundnut

R. 14. Ag. Bot. 203 Improvement of groundnut by hybridisation in bunch groundnut

R. 14. Ag. Bot. 205 Maintenance and evaluation of genetic stock of groundnut

R. 14. Ag. Bot. 206 Evaluation of elite breeding materials in sesamum

R. 14. Ag. Bot. 207 Evolution of long duration (120 days) sesamum variety for rainfed areas

R. 14. Ag. Bot. 208 Evolution of short duration (80-90 days) varieties superior to TMV 3 for rainfed cropping

R. 14. Ag. Bot. 209 Studies on heterosis in sesamum for yield

R. 14. Ag. Bot. 210 Evolution of short duration sesamum variety for early monsoon rainfed condition (80-90 days)

R. 14. Ag. Bot. 211 Maintenance and evaluation of genetic stock in sesamum

R. 14. Ag. Bot. 212 Evolving high yielding semi-spreading groundnut varieties

R. 14. Ag. Bot. 213 Development of drought resistant bunch groundnut.

R. 14. Ag. Bot. 214 Evolving high yielding varieties in spreading groundnut superior to TMV 4.

R. 14. Ag. Bot. 215 Development of bold kernelled varieties in groundnut.

R. 14. Ag. Bot. 216 Evolution of early maturing bunch varieties of groundnut (80 - 90 days)

R. 14. Ag. Bot 217 Evolving high yielding varieties of groundnut combining resistance to leafminer and rust.

R. 14. Ag. Bot.	218	Evolution of resistant varieties of sesamum in bunch groundnut.
R. 14. R. B	201	Evolution of resistant varieties of sesamum to shoot webber.

AGRONOMY

R. 14. Agron.	201	Intercropping studies in groundnut.
R. 14. Agron.	202	Groundnut based relay cropping.
R. 14. Agron.	203	Estimation of reduction in groundnut yield due to delayed sowing under irrigated condition and identification of suitable early maturing variety.
R. 14. Agron.	204	Evolution of dryland technology for rainfed groundnut.
R. 14. Agron.	205	Studies on the efficacy of low cost technology advocated for groundnut drum rolling.
R. 14. Agron.	206	Integrated weed management in groundnut.

SOIL SCIENCE AND AGRICULTURAL CHEMISTRY

R. 14 SS & AC	206	Oil analysis of groundnut varieties tested in the trials of AICORPO.
R. 14. SS & AC	207	Studies on the possibilities of avoiding micronutrient application every year.
R. 14. SS & AC	208	Effect of soil compaction by roller in open textured soil on moisture, nutrient contents and yield of groundnut.
R. 14. SS & AC	209	Analysis of fieldwise farm soils for assessment of fertility status at presowing and post-harvest stages.
R. 14. SS & AC	210	Studies on the response of groundnut to application of micronutrients.
R. 14. SS & AC	211	Study on the nutrition of groundnut by application of farm waste materials.

AGRICULTURAL ENTOMOLOGY

R. 14. Ag. Ent.	101	Studies on Indian eriophyoidea.
R. 14. Ag. Ent.	202	Studies on the control of pest of groundnut

R. 14. Ag. Ent. 203	Control of major pests of sesamum.
R. 14. Ag. Ent. 204	Control of phyllody disease of sesamum by the insecticidal control of the vector.
R. 14. Ag. Ent. 205	Screening of varieties of gingelly for resistance to major pests.
R. 14. Ag. Ent. 206	Bio-ecology of groundnut leaf minor and pod borer.
R. 14. Ag. Ent. 207	Studies on the biology and control of the gingelly pod bug.
R. 14. Ag. Ent. 208	Screening of groundnut varieties for resistance against leaf minor and pod borers.

HORTICULTURE

R. 14. Hort. 101	Germplasm collection, description of types and varieties in cashew.
R. 14. Hort. 201	Hybridization and selection in cashew.
R. 14 Hort. 202	Progeny trial in cashew.
R. 14. Hort. 204	Propagational trials in cashew.
R. 14. Hort. 205	Pruning trial in cashew.
R. 14. Hort. 206	Hormonal application to increase the fruit set in cashew.
R. 14 Hort. 209	NPK fartiliser experiment in cashew.
R. 14. Hort. 211	Foliar application of urea and pesticide.
R. 14. Hort. 212	Trials on control of stemborer in cashew.
R. 14. Hort. 214	Studies on the evaluation of suitable varieties of tapioca for extraction of oil from seed.
R. 14. Hort. 215	Studies to assess optimum density of foliage for tapioca.
R. 14 Hort. 216	Studies on various practices to reduce HCN content in tapioca.
R. 14. Hort. 217	Evaluation of tapioca varieties with short duration.
R. 14. Hort. 218	Studies on rapid multiplication in tapioca.

R. 14. Hort. **219** Studies on tier system of planting tapioca.

R. 14. Hort. **220** Studies on intercropping in tapioca.

R. 14. Hort. **221** Studies on season of planting in tapioca.

R. 14. Hort. **222** Variatal performance studies in tapioca.

CASTOR RESEARCH STATION, POTTANERI

AGRICULTURAL BOTANY

R. 16. Ag. Bot. 101 Maintenance of germplasm bank of castor.

R. 16. Ag. Bot. 201 Breeding of early and uniform maturing types of castor.

R. 16. Ag. Bot. 202 Induced mutatior in castor.

R. 16. Ag. Bot. 203 Evolution of high yielding hybrid castor.

R. 16. Ag. Bot. 204 Evolution of long and medium duration castor for mixed cropping, hybridisation and selection.

UNIVERSITY RESEARCH CENTRE, KOVILPATTI

AGRICULTURAL BOTANY

R. 17. Ag. Bot. 205 Evaluation of breeding materials/germplasm and selection of promising greengram varieties

R. 17. Ag. Bot. 206 Evaluation of breeding materials/germplasm and selection of promising redgram varieties

R. 17. Ag. Bot. 207 Evaluation of breeding materials/germplasm and selection of promising redgram varieties

R. 17. Ag. Bot. 208 Evaluation of breeding materials/germplasm and selection of promising cowpea varieties

R. 17. Ag. Bot. 211 Evaluation of high yielding stable sorghum varieties and hybrids suitable for rainfed black soils

R. 17. Ag. Bot. 212 Evaluation of high yielding bajra varieties and hybrids suitable for rainfed black soil tract

R. 17. Ag. Bot. 213 Evaluation of high yielding stable varieties of panivaragu and kudiraivali suitable for rainfed black soil tract

R. 17. Ag. Bot. 214 Breeding an American variety of cotton superior to Bharathi for the rainfed tract of Tamil Nadu

R. 17. Ag. Bot. 216 Breeding a hybrid cotton for the rainfed tract of Tamil Nadu

R. 17. Ag Bo.t 221	Evaluation of breeding materials/germplasm and selection of promising sunflower varieties
R. 17. Ag. Bot. 223	Screening of breeding lines of early duration field lab-lab (*Mochai*) *varieties* with synchoronious maturity in drylands
R. 17. Ag. Bot. 224	Studies on intercropping systems jowar + cowpea, cotton + cowpea
R. 17. Ag. Bot. 225	Breeding horsegram *(Dolichos biflorus)* for high yield and suitability for intercropping systems
R. 17. Ag. Bot. 228	Breeding for drought tolerance
R. 17. Ag. Bot. 229	Breeding an inter-hirsutum cotton hybrid for the rainfed and irrigated tracts of Tamil Nadu
R. 17. Ag. Bot. 230	Breeding an inter-specific hybrid (G. hirsutum × G. barbadence) for the irrigated cotton tracts of Tamil Nadu

AGRONOMY

R. 17. Agron. 221	Verification trials on sorghum and bajra
R. 17. Agron. 227	Formulation of package of practices for fruits of minor importance-studies on watermelon varieties suitable for rainfed tract
R. 17. Agron. 228	Effect of jerking CCC application on the yield of bajra under rainfed conditions
R. 17. Agron. 229	Contingency planning to meet aberrant weather-mid season corrections
R. 17. Agron. 230	Study of crop mixtures-Inter-cropping trial in K - Tall sorghum with vegetable crops
R. 17. Agron. 231	A production technique to make cotton cultivation remunerative
R. 17. Agron. 232	Study of agronomic requirements of new varieties in relation to their plant densities and fertilizer levels
R. 17. Agron. 233	Effect of antitranspirants on rainfed cotton through ridging for mositure conservation
R. 17. Agron. 234	Developing on dryland technology for misture conservation by different systems of farming
R. 17. Agron. 235	Effect of advancement of fertilizer application and sowing of seeds of sorghum
R. 17. Agron. 236	Studies on presowing hardening of seeds for inducing drought tolerance in rainfed cotton

R. 17. Agron. (ORP.)	201	Operational research on improved technology under rainfed condition

HORTICULTURE

R. 17. Hort.	101	Evaluation of germplasm of capsicum under irrigated condition
R. 17. Hort.	201	Breeding of varieties superior to K1 and K2
R. 17. Hort.	202	Performance of types of strains of chillies
R. 17. Hort.	203	Companion crop of onion with chilli
R. 17. Hort.	204	Evolution of a chilli variety for dry tract of Tamil Nadu
R. 17. Hort.	205	Breeding for pest (thrips) resistance
R. 17. Hort.	206	Breeding for fruit rot resistance in chillies
R. 17. Hort.	207	Mutation breeding of chillies for destalk type
R. 17. Hort.	209	Systems of cropping in chillies

SOIL SCIENCE AND AGRICULTURAL CHEMISTRY

R.17. SS & *Ac.*	211	Influence of intercropping systems on the fertility of the soils
R.17. SS & AC.	212	Mitigating the adverse effect of drought on blackgram crop nutrition
R.17. SS & AC.	213	Soil moisture studies with special reference to anti-transpirants on rainfed cotton
R.17. SS & AC.	214	Studies on the effect of application of organic wastes on the improvement of physical properties of soil under dry-land agriculture
R.17. SS & *AC.*	215	Effect of organic mulches on soil temperature and soil moisture in relation to millets
R.17. SS & AC.	216	Fertilizer use in dryland agriculture. Effect of farm yard manure and rhizobium in the efficient use of fertilizer in dryland agriculture with special reference to pulses

PLANT PATHOLOGY

R. 17. Pl. Path.	201	Studies on the epidemiology and control of blackarm, alternaria leaf spot and boll rot diseases of cotton
R. 17. Pl. Path.	202	Studies on varietal resistance in chillies to die-back and fruit rot and developing a method of control

AGRICULTURAL ENTOMOLOGY

R. 17. Ag. Ent. 203 Chemical control of cotton pests

R. 17. Ag. Ent. 204 Ecological studies on cotton pests

AGRICULTURAL EXTENSION

R.17. Ag. Extn. 201 Study on the effectiveness of demonstration in increasing the technological knowledge of farmers growing pulses and oilseeds

R.17. Ag. Extn. 202 Factors responsible for the preference of blackgram over greengram among farmers of Ambasamudram area

AGRICULTURAL ENGINEERING

R. 17. S. W. C. 203 Water harvesting and run-of recycling supplemental irrigation with sorghum

COTTON RESEARCH STATION, SRIVILLIPUTHUR

AGRICULTURAL BOTANY

R. 18. Ag. Bot. 204 Breeding a variety of cotton superior to MCU 8 for the long duration rice fallows of Tamil Nadu

R. 18. Ag. Bot. 207 Synthesising a hybrid cotton suitable for surnmer irrigated tract of Tamil Nadu

R. 18. Ag. Bot. 208 Breeding an early maturing variety of cotton superior to MCU 7 suitable for short duration rice-fallows of Tamil Nadu

R. 18. Ag. Bot. 211 Breeding a variety of cotton superior to MCU 7 for medium duration rice-fallows of Tamil Nadu

R. 18. Ag. Bot. 212 Evaluation of high yielding and dorught resistant strains of rice of 100-120 days duration

AGRONOMY

R. 18. Agron. 211 Studies on the use of bio-fertilizers in economising nitrogen fertilizers

R. 18. Agron. 212 To study the feasibility of intensive cropping pattern for summer irrigated cotton tract

R. 18. Agron. 213 Agronomic requirements of the two varieties in relation to their plant densities and fertilizer levels

R. 18. Agron. 214 Studies on the use of herbicides for weed control in cotton

R. 18. Agron. 215 Efficiency of slow release nitrogen fertilizer in cotton

R. 18. Agron.	216	Irrigation requirement of cotton based on critical stages approach

SOIL SCIENCE & AGRL. CHEMISTRY

R. 18. SS&AC	203	Nutrient requirement of cotton in fixed cropping sequence
R. 18. SS&AC.	204	Studies on the response of rice to zinc fertilization
R. 18. SS&AC.	206	Studies on the response of cotton to zinc application

PLANT PATHOLOGY

R. 18. Pl. Path.	204	Control of helminthosporiose disease on paddy

AGRL. ENTOMOLOGY

R. 18. Ag. Ent.	205	Evolving pest monagement practice in rice with special reference to time and method of insecticide application in relation to pest population
R. 18. Ag. Ent.	206	Screening for resistance in cotton to major insect pests
R. 18. Ag. Ent.	207	Studies on the control of cotton boll worm using synthetic pyrethroids
R. 18. Ag. Ent.	208	Economising the insecticial application for the control of cotton boll-worm

CROP PHYSIOLOGY

R.18.Pl.Physiol.	201	Crop canopy studies in cotton and the effect of topping on growth and physiological aspects in cotton
R.18.Pl.Physiol.	202	Evaluation of drought resistant culture suitable for summer Combodia tract of Tamil Nadu

KRISHI VIGYAN KENDRA, PONDICHERY

AGRICULTURAL BOTANY

R. 19. Ag. Bot.	201	Evolution of high yielding early varieties of rice maturing in less than 100 days and possessing high degree of resistance to pests and diseases
R. 19. Ag. Bot.	202	Evolution of high yielding and pests and diseases resistant strains of rice of 100-120 days duration
R. 19. Ag. Bot.	203	Evolution of improved strains of rice of 120-140 days duration resistant to major pests and diseases

R. 19. Ag. Bot.	204	Evolution of high yielding strains of rice of 140-160 days duration resistant to major pests and diseases
R. 19. Ag. Bot.	205	Improvement of long duration varieties of rice (160 days and above) for high yield and resistance to pests and diseases
R. 19. Ag. Bot.	206	Evaluation of ragi varieties and prerelease cultures suitable for January and June seasons
R. 19. Ag. Bot.	207	Evaluation of bunch type groundnut varieties and pre-release cultures under irrigated conditions suitable for summer season (Jan-Mar)
R. 19. Ag. Bot.	208	Evaluation of blackgram and greengram varieties and pre-release cultures suitable for January and June seasons

AGRONOMY

R. 19. Agron.	205	Cumulative effect of different levels of potash under fixed levels of phosphorus and two levels of nitrogen in a four crop rotation
R. 19. Agron.	206	Evaluation of high yielding quality canes for Pondicherry region
R. 19. Agron. (ORP)	207	Integrated weed management for different cropping systems in selected agroclimatic regions in Tamil Nadu

AGRL. ENTOMOLOGY

R. 19. Ag. Ent.	204	Integrated pest management in rice
R. 19. R. B.	201	Evaluation of breeding lines of rice resistant to rice diseases

CROP PHYSIOLOGY

R.19.Pl.Physiol.	201	Evaluation of breeding line of rice for biological yield and economic yield during samba season

AGRL. ENGINEERING

R.19.Ag.Engg.	201	Potentials and efficiency of waste aquatic weeds for bio-gas production

KUMARAPERUMAL FARM SCIENCE CENTRE, TRICHY

AGRONOMY

R. 32. Agron.	202	Studies on the sowing methods of ragi in alkaline soil

R. 32. Agron.	203	Effect of planting methods and management practices of rice in sodic soil
R. 32. Agron. (ORP)	201	Operational research project for dryland technology at Manapparai
R. 32. Agron. (ORP)	202	Operational research project for dry land technology at Ariyalur (Black soil)

FORESTRY

R.32.Forestry	201	Evolution of a superior strain of *Casuarina equisetifolia* by selection
R.32.Forestry	202	Studies on juvenile-adult correlation for vigour in *Casuarina equsetifolia*
R.32.Forestry	203	Study on the association of sex expression to growth vigour in *Casuarina equisetifolia*
R.32.Forestry	204	Floral biology and pollination in *Casuarina equisetifolia*

AGRICULTURAL BOTANY

R. 32. R. B.	201	Development of isogenic non-restorer pearl millet lines varying in sources for genes for resistance to downy mildew and testing at various locations
R. 32. Ag.Bot.	208	Evaluation of high yielding varieties of sorghum suited to alkali soil condition
R. 32. Ag.Bot.	209	Evaluation of high yielding varieties of cumbu resistant to alkaline soil condition
R. 32. Ag.Bot.	210	Evaluation of high yielding varieties of varagu and ragi resistant to saline and alkaline condition
R. 32. Ag.Bot.	211	Evaluation of high yielding varieties of groundnut and gingelly resistant to alkaline soil condition

CROP PATHOLOGY

R.32. Pl. Path.	201	Studies on the epidemiology of ergot disease of pearl-millet and working out a schedule of control measures.

AGRICULTURAL ENTOMOLOGY

R.32. Ag. Ent.	203	Control of major pests of chillies
R.32. Ag. Ent.	204	Studies on the seasonal incidence and control of major pests of bhendi and brinjal

R. 32. Ag.Ent.	**205**	Control of pests of sorghum raised under rainfed conditions using seed treatment with insecticides

AGRICULTURAL EXTENSION & AGRICULTURAL ECONOMICS

R.32.Agrl.Extn.	201	Effectiveness of selected training methods
R.32.Agrl.Extn.	202	Evaluation of convenors' training programme
R.32.Ag. Econ.	203	Cost of cultivation and marketing practices in banana and sugarcane

ANIMAL HUSBANDRY

R. 32. AH	201	Optimum seed rate of sorghum and maize alone and in combinations with cowpea for fodder
R. 32. AH.	202	Management pratices of cattle and buffalo in rural and urban condition
R. 32. AH.	203	Goat rearing under grazing-cum-stall feeding condition

HORTICULTURE

R. 32. Hort.	222	Evaluation of high yielding varieties of cluster beans suitable for Trichy region
R. 32. Hort.	223	Selection of coriander types in problem soil
R. 32. Hort.	224	Selection of bhendi varieties in problem soll
R. 32. Hort.	225	Soreening and development of suitable varieties of sweet potato for growing in rice fallows and in alkaline soils
R. 32. Hort.	226	Screening and development of suitable varieties of colacasia in rice fallows and in alkaline soils
R. 32. Hort.	227	Studies on the efficacy of different methods of planting in colacasia
R. 32. Hort.	228	Studies on tne evaluation and optimum size of planting in elephant yam
R. 32. Hort.	229	Screening and development of suitable varieties of coleus for growing in rice fallows and banana plantations
R. 32. Hort.	230	Studies on the evaluation and suitability of minor tubers viz (1) Elephant yam (2) Typhenium (3) Colocasina (4) Coleus and (5) Diascorea for growing as associated crops in banana plantations

R. 32. Hort.	231	Improvement of moringa
R. 32. Hort.	232	Improvement of *Nerium odarum*
R. 32. Hort.	233	Evaluation of banana varieties suitable for alkali soil in Trichy region

NATIONAL PULSES RESEARCH CENTRE, VAMBAN

AGRICULTURAL BOTANY

R. 35. Ag. Bot. 201	Study of germplasm materials of redgram
*R. 35. Ag. Bot.*202	Evolution of high yielding varieties of redgram through hyblidization and evaluation of promising breeding materials obtained from different sources
*R. 35. Ag. Bot.*203	Evaluation of promissing breeding materials of cowpea, soybean, lab-lab etc obtained from different sources
R. 35. Ag. Bot 204	Study of germplasm materials of greengram
*R. 35. Ag. Bot.*205	Evolution of high yielding varieties of greengram through hybridization and mutation breeding and evolution of promising breeding materials obtained from different sources
R. 35. Ag. Bot. 206	Evolution of high yielding varieties of blackgram through hybridization and mutation breeding and evaluation ot promising breeding materials obtained from differenf sources
R. 35. Ag. Bot. 207	Study of germplasm materials of blackgram
*R. 35. Ag. Bot.*208	Study of germplasm materials of horsegram
*R. 35. Ag. Bot.*209	Evolution of high yielding varieties of horsegram through hybridization and mutation breeding and evaluation of promising materials obtained from different sources

AGRONOMY

R. 35. Agron.	201	Response of greengram varieties to population densities and phosphate levels
R. 35. Agron.	202	Fertilizer studies on greengram under irrigated condition
R. 35. Agron.	203	Response of blackgram varieties to population densities and phosphate levels

R. 35. Agron.	204	Fertilizer studies on blackgram under irrigated condition
R. 35. Agron.	208	Studies on pre-seaking seeds of greegram in nutrient solution under rainfed condition
R. 35. Agron.	211	Fertilization in inter-cropping system
R. 35. Agron.	212	Effect of kharif legumes in cropping systems on fertilizer 'N' requirement of rabi cereals
R. 35. Agron.	213	Apportionment of fertilizers in cropping sequence under irrigated condition
R. 35. Agron.	217	Studies on the effect of clipping on the yield of Kulthi (Horsegram)
R. 35. Agron.	218	Time of sowing trial on redgram (Arhar) genotypes
R. 35. Agron.	219	Performance of different varieties of Kulthi at various dates of sowing and row spacing

PLANT PATHOLOGY

R. 35. Pl. Path.	201	Varietal screening of greengram under field coeditions for major diseases
R. 35. Pl. Path.	202	Field screening of backgram and cowpea genetic stocks with a view to isolate resistant types for major diseases
R. 35. Pl. Path.	203	Evolving rapid screening methods and fungicidal control of *Cercospora* leaf spot disease of blackgram and greengram
R. 35. Pl. Path.	204	Intensive screening and evolving chemical method of control of powdery mildew disease of greengram and blackgram
R. 35. Pl. Path.	205	Evolving methods of quick screening and fungicidal control of *Rhizoctonia* and *Pellicularia* disease complex of pulses
R. 35. Pl. Path.	206	Evolving method of control of yellow mosaic of greengram and blackgram by insecticidal application and use of potassic and phosphatic fertilizers
R. 35..Pl. Path.	207	Evolving suitable control methods for anthracnose of cowpea and lab - lab.

R. 35. Pl. Path. 208 Varietal screening and evolving suitable control methods for horsegram diseases.

R. 35. Pl. Path. 209 Varietal screening of redgram under field conditions for major diseases.

AGRICULTURAL ENTOMOLOGY

R. 35. Ag. Ent. 201 Chemical control of pod borers in greengram.

R. 35. Ag. Ent. 202 Chemical control of pod borer in blackgram.

R. 35. Ag. Ent. 203 Chemical control of pod borer in horsegram.

R. 35. Ag. Ent. 204 Chemical control of pod borer in cowpea.

R. 35. Ag. Ent. 205 Varietal resistance of cowpea to pod borer.

R. 35. Ag. Ent. 206 Screening of varieties of redgram to pod borer.

R. 35. Ag. Ent. 207 Chemical control of pod borer and pod fly in redgram.

R. 35. Ag. Ent. 208 Studies on the varietal resistance of greengram with reference to their ecology.

R. 35. Ag. Ent. 209 Screening of varieties of horsegram and blackgram for resistance to major pests.

R. 35. Ag. Ent. 212 Seed storage studies on pulses.

MICROBIOLOGY

R. 35. Micro. 201 Screening of rhizobia for their symbiotic efficiency in different pulses.

R. 35. Micro. 202 Screening of germplasm collections of pulses for nodulation to the native strains of rhizobia.

R. 35. Micro. 203 Interaction between plant protection chemicals and the legume - rhizobia symbiosis.

R. 35. Micro. 204 Influence of soil amendments on nodulation by rhizobial cultures.

R. 35. Micro. 205 Isolation and screening for efficient rhizobial strains of blackgram, greengram suitable for rice-fallow conditions.

R. 35. Micro. 209 Studies on techniques for improving the survival and efficiency of rhizobial inoculant in Vamban farm.

SCHEME FOR THE BIOLOGICAL CONTROL OF BLACK - HEADED CATERPILLAR, SALEM

R. 36. Ag. Ent. 201 (ORP) Operational research on the control of black - headed caterpillar of coconut.

SCHEME FOR THE SURVEILLANCE OF PESTS AND DISEASES, VELLORE

R. 40. Ag. Ent. 207 Scheme for the surveillance of pests and diseases in North Arcot district.

FACULTY OF HORTICULTURE

DEPARTMENT OF POMOLOGY

R. 1. Hort. 216 Breeding investigations in banana.

R. 1. Hort. 219 Introduction, selection & breeding of new papaya varieties

R. 1. Hort. 221 Water requirement studies in papaya.

R. 1. Hort. 226 Effect of etherel & pruning on mango.

R. 1. Hort. 227 Fertilizer response studies in banana.

R. 1. Hort. 228 Water requirement of banana.

R. 1. Hort. 229 Nutritional studies in grape.

R. 1. Hort. 230 Rootstock studies in grape.

R. 1. Hort. 231 Studies on training & pruning of grape.

R. 1. Hort. 232 Varietal improvement in grapes.

R. 1. Hort. 233 Influence of growth regulators on papaya.

R. 1. Hort. 234 Seasonal influence of sex in papaya.

R.1.Hort.Pomol. 207 Investigations to standardise rapid methods of vegetative propagation techniques in some fruit plants.

R.1.Hort.Pomol. 209 Spacing trial in grapes.

R.1.Hort.Pomol. 210 Physiological assessment of yield and quality parameters in grapes in relation to nutritional status.

R.1.Hort.Pomol. 211 Varietal evaluation in pomegranate.

R.1.Hort.Pomol. 212 Studies on nematode parasites of banana.

R.1.Hort.Pomol. 213 Studies on nematode parasites of grapevine.

R.1.Hort.Pomol. 214 Studies on nematode parasites of papaya.

R.1.Hort.Pomol. 215 Studies on fungal diseases of banana.

R. 1. Hort. Pomol. 216 Dwarfing of mango & guava.

R. 1. Hort. Pomol. 220 Physiological assessment of papain yield and quality.

R. 1. Hort. Pomol. 221 Studies on training of grape under close planting.

R. 1. Hort. Pomol. 222 Investigations to control finger drop of Rasthali banana.

DEPARTMENT OF OLERICULTURE, COIMBATORE

R. 1. Hort. Oleri. 219 Improvement of cucumber and melons.

R. 1. Hort. Oleri. 223 Improvement of Bellary onion.

R. 1. Hort. Oleri. 224 Standardization of agrotechniques and storage methods for onion.

R. 1. Hort. Oleri. 225 Studies on the effect of growth regulators to increase fruit set in chilli, brinjal and tomato.

R. 1. Hort. Oleri. 226 Breeding of multiple resistance for pest and diseases in bhendi.

R. 1. Hort. Oleri. 228 Nutritional and cultural requirements of *Coleus.*

R. 1. Hort. Oleri. 229 Nutritional and cultural requirement of colocasia.

R. 1. Hort. Oleri. 231 Co-ordinated varietal testing in sweet potato.

R. 1. Hort. Oleri. 232 Evolving destalk types of chillies.

R. 1. Hort. Oleri. 233 Studies on the fertilizer requirement of direct sown and transplanted chillies.

R. 1. Hort. Oleri. 234 Mutation breedling in tapioca.

R. 1. Hort. Oleri. 235 Improvement of capsicum.

R. 1. Hort. Oleri. 236 Influence of climatic factors on flowering, fruit set, growth and development of sweet pepper.

R. 1. Hort. Oleri. 237 Studies on minor tuber crops. (*Coleus*, *Colocasia* and *Dioscorea*)

R. 1. Hort. Oleri. 238 Mutation breeding in radish.

R. 1. Hort. Oleri. 239 Mutation breeding in French beans.

R. 1. Hort. Oleri. **240** Varietal evaluation of turnip.

R. 1. Hort. Oleri. **241** Varietal evaluation of knol khol.

R. 1. Hort. Oleri. **242** Seasonal and cultural requirement of early synthetic cauliflower.

R. 1. Hort. Oleri. **243** Verietal evaluation of beet root.

R. 1. Hort. Oleri. **244** Heterosis breeding in brinjal.

R. 1. Hort. Oleri. **245** Heterosis breeding in bhendi.

R. 1. Hort. Oleri. **246** Heterosis breeding in tomato.

R. 1. Hort. Oleri. **247** Heterosis breeding in chilli.

DEPARTMENT OF FLORICULTURE, COIMBATORE

R. 1. Hort. Flori. **202** Studies on water requirements of *J. grandiflorum.*

R. 1. Hort. Flori. **207** Evaluation of chrysanthemum varieties.

R. 1. Hort. Flori. **208** Studies on micro-nutrients in crossandra.

R. 1. Hort. Flori. **211** Manurial trial in Maruvu.

R. 1. Hort. Flori. **212** Manurial trial in Dhavanam.

R. 1. Hort. Flori. **214** Mutation breeding in bougainvillea.

R. 1. Hort. Flori. **215** Breeding and evaluation of hibiscus hybrids and cultivars.

R. 1. Hort. Flori. **225** Collection and testing of orchids.

DEPARTMENT OF SPICES & PLANTN. CROPS, COIMBATORE

R. 1. Hort. Sp. & *P. Cr* **201** Evolving high yielding turmeric types.

R. 1. Hort. Sp. & *P. Cr.* **202** Evolving high yielding coriander better than Co 1.

R. 1. Hort. Sp. & *P. Cr.* **203** Selection for high yielding fenugreek type.

R. 1. Hort. Sp. & *P. Cr.* **204** Varietal studies on arecanut.

R. 1. Hort. Sp. & *P. Cr.* **206** Evolving high yielding types of fennel.

R. 1. Hort. Sp. & *P. Cr.* **211** New introductions & evaluation of spices & plantation crops.

R. 1. Hort. Sp. & *Pl. Cr.* 213 Trial to determine the optimum dose of NPK fertilizers for coriander

R. 1. Hort. Sp. & *Pl. Cr.* 214 Studies on rapid multiplication in turmeric.

R. 1. Hort. Sp. & *Pl. Cr.* 215 Studies on "No tillage" on turmeric

R. 1. Hort. Sp. & *Pl. Cr.* 216 Studies on the influence of different levels of pottassium on yield & quality of turmeric.

R. 1. Hort. Sp. & *Pl. Cr.* 217 Mutation breeding in coriander

R. 1. Hort. Sp. & *Pl. Cr.* 221 Determination of suitabe multicropping in arecanut for Tamil Nadu.

R. 1. Hort. Sp. & *Pl. Cr.* 222 Evaluation of *Solanum hasianum*

R. 1. Hort. Sp. & *Pl. Cr.* 223 Evaluation of senna

R. 1. Hort. Sp. & *Pl. Cr.* 224 Evaluation of *Dioscorea floribunda*

R. 1. Hort. Sp. & *Pl. Cr.* 225 Evaluation of aromatic plants (vettiver, cymbopogan grasses, musk)

DEPARTMENT OF FOOD SCIENCE & NUTRITION

R. 1. Food Tech. 217 Studies on the preparation of sweet potato flour

R. 1. Food Tech. 218 Utilisation and acceptability of sweet potato flour

R. 1. Food Tech. 219 Studies on the incorporation of millet flours in bakery products

R. 1. Food Tech. 220 Studies on the incorporation of millet flours in bakery products.

DEPARTMENT OF HORTICULTURE, MADURAI

R. 2. Hort. 209 Evolving superior mutants of brinjal through induced mutagenesis

R. 2. Hort. 210 Studies on the effect of graded doses of potash on the performance of guava (*Psidium guajava* L.)

R. 2. Hort. 212 Improvement of jasmine varieties through breeding

R. 2. Hort. 213 Improvement of agro-techniques for tuberose (*Ployanthus tuberosa*)

R. 2. Hort.	219	Selection and breeding in snakegourd
R. 2. Hort.	207	Improvement of yield of *Catharanthus roseus*
R. 2. Hort.	221	Introduction, selection, breeding and propagational studies in ornamental hibiscus
R. 2. Hort.	222	Introduction, selection, hybridisation and mutation breeding in ash gourd and pumpkin
R. 2. Hort.	223	Introduction, selection, hybridization and mutation breeding to improve yield of melons.
R. 2. Hort.	224	Introduction, selection and hybridization to improve yield of onions
R. 2. Hort.	225	Development of improved pruning, manurial and other cultural techniques in jasmine.
R. 2. Hort.	226	Introduction, selection, hybridization and mutation breeding in bitter gourd.
R. 2. Hort.	227	Introduction, selection, hybridization and mutation breeding in bhendi
R. 2. Hort.	228	Introduction, selection and improvement of yield of gomphrena
R. 2. Hort.	229	Introduction, selection and improvement of vetiver (*Vetiveria zizanoides* L.)
R. 2. Hort.	230	Introduction, selection and improvement of *Urgenia indica* and *Gloriosa superba*
R. 2. Hort.	231	Investigation of sapota rootstocks
R. 2. Hort.	232	Introduction, selection and hybridization for the improvement of yield of chillies.
R. 2. Hort.	233	Vertical evaluation of chrysanthemum
R. 2. Hort.	234	Evaluation of relative efficacy of organic and inorganic fertilizers in chrysanthemum
R. 2. Hort.	235	Comparative studies with different planting materials of yield, earliness and flower quality in chrysanthemum

R. 2. Hort.	236	Introduction and selection of improvement of marigold.
R. 2. Hort.	237	Studies on heterosis breeding in marigold

HORITICULTURAL RESEARCH STATION, PERIYAKULAM

R. 6. Hort.	201	Improvement of mango through selection and breeding
R. 6. Hort.	206	Manurial studies on guava
R. 6. Hort.	210	Improvement of tomato through selection and breeding
R. 6. Hort.	213	Improvement cf sapota through breeding
R. 6. Hort.	214	Improvement of cucurbitaceous crops through selection and breeding
R. 6. Hort.	215	Improvement of brinjal through selection and breeding
R. 6. Hort.	218	Improvement of planting material for acid lime
R. 6. Hort.	219	Influence of growth regulators on frurt set, fruit drop and quality of acid lime and mandarin
R. 6. Hort.	220	Effect of variable doses of nitrogen on acid lime and mandarin.
R. 6. Hort.	221	Improvement of acid lime throgh selection
R. 6. Hort. Cr. Physol.	222	Effect of foliar application of macro and micronutrients in maximisation of yield and quality of fruits of Lucknow-46 guava
R. 6. Hort. Ag. Ent.	224	Evaluation of open pollinated clones of sweet potato for weevil resistance
R. 6. Hort. Ag. Ent.	225	Studies on guava tea mosquito bug *(Helopeltis antonii)*
R. 6. Hort. Ag. Ent.	226	Studies on the pests affecting inflorescence of mango and their control
R. 6. Hort. Pl. Path.	227	Isolation and evaluation of tristeza mild strains on acid lime from Tamil Nadu.
R. 6. Hort. Pl. Path.	228	Studies on epidemiology of canker on acid lime and its interaction with citrus leaf miner

R.6. Hort. Phy. 201	Studies on secondary and micronutrients on acid lime
R.6. Hort. Phy. 202	Studies on drought tolerance and moisture conservation in acid lime
R.6. Hort. Phy. 203	Control of weeds with herbicides in acid lime orchards
R.6. Hort. Phy. 204	Effect of graded doses of zinc sulphate on the growth and productivity of acid lime under Lower Palney conditions
R. 6. Hort. Phy. 205	Studies on secondary and micronutrients on mandarin
R. 6. Hort. Pl. Path. 201	Control of virus diseases in acid lime
R.6. Hort. Pl. Path. 202	Control of powdery mildew in mandarin
R.6. Hort. Pl. Path 203	Studies on citrus canker
R.6. Hort. Pl. Path. 204	Chemical control of twig blight caused by *Colletotri-chumgleosporoides*
R.6. Hort. Pl. Path. 205	Studies on bud transmissible diseases of acid lime

HORTICULTURAL RESEARCH STATION, KODAIKANAL

R. 7. Hort.	207	Manurial trial in apple with Parlin's Beauty
R. 7. Hort.	210	Studies on fruiting habit and pruning in apple Parlin's Beauty
R. 7. Hort.	246	Introduction and selection of suitable straberry varieties for Kodaikanal
R. 7. Hort.	248	Effect of graded doses of NPK on the yield and quality of *country pear*
R. 7. Hort.	249	Survey, selection and introduction of high yielding and superior quality pear varieties
R. 7. Hort.	252	Collection, introduction and evaluation of garlic types
R. 7. Hort.	260	Multi-tier system of cropping in fruits
R. 7. Hort.	236	Hormonal trials in digitalis
R. L. Hort.	242	Trace element studies in geranium
R. 7. Hort.	244	Defloration studies in *Digitalis lanata*

R. 8. Hort.	245	Breeding in digitalis and pyrethrum
R. 7. Hort.	253	Collection and evaluation of geranium varieties
R. 7. Hort.	254	Studies on different levels of cuttings on the herbage yield and oil content in geranium
R. 7. Hort.	256	Studies on the seasonal variation on flower production and pyrethrin content in pyrethum
R. 7. Hort.	257	Studies on the floral biology and breeding behaviour of pyrethrum and digitalis
R. 7. Hort.	258	Studies on the effect of time of planting and number of pluckings on foliage yield and total glycoside content in *Digitalis lanata*
R. 7. Hort.	259	Response of foliar nitrogen on the yield of foliage and total glycoside content in *Digitalis lanata*
R. 7. Hort.	266	Effect of harvest management practices on the yield and oil quality of *Mentha citrata*
R. 7. Hort.	267	Effect of soil pH on the rooting of mint (*Mentha citrata*)
R. 7. Hort.	268	Response of micronutrients on the yield of foliage and oil content in mint
R. 7. Hort.	269	Effect of plant density on the herbage and oil yield in geranium
R. 7. Hort.	270	Rejuvenation studies on geranium (*Pelargonium graveolens*)
R. 7. Hort.	271	Improvement of geranium through mutation breeding
R. 7. Hort.	272	Effect of sources of P and time of application on the herbage yield, oil content and quality of oil of geranium
R. 7. Hort.	273	Effect of foliar spray of micronutrients in geranium (Private holding)
R. 7. Hort.	274	Micronutrient uptake studies in pyrethrum
R. 7. Hort.	275	Effect of liming on soil available phosphorus and flower production in pyrethrum
R. 7. Hort.	276	Physiology of growth and development in digitalis

R. 7. Hort.	225	Standardization of seed production techniques in cauliflower
R. 7. Hort.	227	Standardization of seed production techniques in cabbage
R. 7. Hort.	232	Standardization of seed production techniques in Asiatic carrot
R. 7. Hort.	261	Breeding for resistance to powdery mildew in peas
R. 7. Hort.	262	Introduction, evaluation and isolation of suitable varieties of beetroot for Kodaikanal hills
R. 7. Hort.	263	Introduction, evaluation and isolation of suitable varieties of beans
R. 7. Hort.	264	Improvement of butter beans through breeding
R. 7. Hort.	265	Introduction, evaluation and isolation of suitable varieties of knol khol

HORTICULTURAL RESEARCH STATION, THADIYANKUDISAI

R. 20. Hort.	205	Introduction of clonal types of cardamom and screening types resistant to katte disease
R. 20. Hort.	206	Cultural and manurial requirement of cardamom
R. 20. Hort.	210	Maximisation of oil content in patchouli
R. 20. HOrt.	236	Rootstock investigation in mandarin
R. 20. Hort.	237	Effect of N, P_2O_5 and K_2O on yield and quality of cinnamon
R. 20. Hort.	238	Nutrient studies in pepper
R. 20. Hort.	239	Improvement of pepper
R. 20. Hort.	240	Nutritional trial in nutmeg
R. 20. Hort.	241	Manurial investigation in clove
R. 20. Hort.	242	Manurial requirement of cocao
R. 20. Hort.	243	Improvement of cocao
R. 20. Hort.	244	Multitier cropping in plantation crops
R. 20. Hort.	245	Studies on propagation of spices and plantation crops

R. 20. Hort.	246	Improvement of capsicum
R. 20. Hort.	233	Selection and improvement of high yielding varieties of French beans
R. 20. Ag. Ent.	202	Integrated control of insect pests of mandarin
R. 20. Ag. Ent.	203	Studies on the control of pests of acid lime
R. 20. Ag. Ent.	204	Studies on the control of pests of cinnamon
R. 20. Ag. Ent.	202	Control of pests of pepper
R. 20. Ag. Ent.	206	Control of pests of cocao
R. 20. Ag. Ent.	207	Evaluation of systemic chemicals for the control of pests of coffee
R. 20. Ag. Ent.	208	Control of pests of vegetable crops
R. 20. Ag. Ent.	209	Studies on the root-knot nematode of patchoui
R. 20. Pl. Path.	202	Studies on the control of mosaic disease in chow-chow
R. 20. Pl. Path.	202	Control of diseases of pepper
R. 20. Pl. Path.	203	Control of diseases of cocao
R. 20. Hort. Pl. Path.	249	Development of techniques for the detection of bunchy top infection before the appearance of visible symptoms
R. 20. Hort. Pl. Path.	247	Control of banana bunchy top by cross protection
R. 20. Hort. Pl. Path.	248	Selection of localities with low angle of colonisation of *Pentalonia nigronervosa* for multiplication of bunchy top free banana suckers

HORTICULTURAL RESEARCH STATION, YERCAUD

R. 21. Hort.	201	Improvement of agro-techniques for mandarin orange
R. 21. Hort.	210	Pomegranate-collection, control of anar butterfly, training experiment, irrigation experiment, fertilizer experiment, investigation of fruit cracking
R. 21. Hort.	211	Fig-collection, irrigation experiment, studies on drying, pollination and problems in bearing

R. 21. Hort.	212	Jack selection, experiment on propagation, agro techniques and multi-tier cropping
R. 21. Hort.	213	Custad apple-collection, experiment on reducing seed content, propagation and on related fruits
R. 21. Hort.	214	Ber-collection, propagation, water use, controlling fruitfly and powdery mildew, utilisation of fruits, training and pruning experiment
R. 21. Hort.	215	Jaman - collection, propagation, improvement of fruit quality, multi-tier cropping
R. 21. Hort.	216	Improvement of cardamom
R. 21. Hort.	222	Determining NPK requirement of mandarin orange
R. 21. Hort.	223	Studies on training in pomegrante
R. 21. Hort.	224	Determing NPK repuirement in mandarin orange
R. 21. Hort.	225	Planting density for cardamom
R. 21 Hort.	227	Varietal-cum-planting system trial in jack
R. 21. Hort.	228	Multi-tier cropping trial in jack
R. 21. Hort.	230	Spacing trial in patchouli
R. 21. Hort.	231	Nutritional studies in patchouli
R. 21. Hort.	232	Collection and evaluation of garlic
R. 21. Hort.	234	Determining the best season of planting garlic
R. 21. Hort.	235	Nutritional trial in garlic
R. 21. Hort.	236	Evaluation of dioscorea species and types
R. 21. Hort.	237	Mutation breeding in eucalyptus
R. 21. Hort.	238	Mutation breeding in patchouli
R. 21. Hort.	239	Determination of NPK requirements of geranium
R. 21. Hort.	244	Evaluation and selection for breeding in medicinal *Solanum* spp

R. 21. Hort.	245	Nutrient uptake studies in geranium
R. 21. Hort. Nematode.	240	Control of plant parasitic nematodes in geranium and patchouli
R. 21. Hort. Nematode.	241	Evaluation of nematicides for the control of root-knot nematodes in geranium and patchouli nursery
R. 21. Hort. Nematode.	242	Assessment of fungicidal efficacy against fig nematode

FORESTRY RESEARCH STATION, METTUPALAYAM

R. 22. For.	201	Response of established bamboo stands (*Bambusa bambos*) to cultural practices and rules of felling
R. 22. For.	202	Response of bamboo (Bambusa bambos) to nitrogen and secondary tillage
R. 22. For.	205	Improvement of eucalyptus resistant to drought and suitable to dry zones of Tamil Nadu
R. 22. For.	207	Studies on floral biology and breeding behaviour in eucalyptus
R. 22. For.	208	Nutriophysiological studies in *Eucalyptus*
R. 22. For.	209	Nutriophysiological studies in *Bambusa bambos*
R. 22. For.	210	Response of solid bamboo (*Dendrocalamus strictus*) to nitrogen and secondary tillage
R. 22. For.	211	Evaluation of the efficacy of different systems of farming viz., agriculture, silviculture, agri-silviculture and silvipasture
R. 22. For.	212	Growth analysis in provenances and species of eucalyptus

SHEEP BREEDING RESEARCH STATION, SANDYNALLAH

R. 28. Hort.	203	Study of evaluation of tea clones suitable for Uthagamandalam condition
R. 28. Hort.	204	Introduction, evaluation and selection of superior cultivars of temperate fruits and nuts
R. 28. Hort.	208	Seed production studied in cabbage, carrot and cauliflower

R. 28. Hort 209 Nutritional studies in cabbage, carrot and cauliflower

R. 28. Hort. 210 Mutation breeding in peas

R. 28. Pl. Path 202 Control of potato viruses by cultural practices

R. 28. Pl. Path. 203 Studies of evaluation of tea clones suitable for Udhagamandalam conditions

R. 28. Pl. Path. 204 Introduction, evaluation and selection of superior cultivars of temperate fruits and nuts

R. 28. SBRS. Forage. 201 Clonal selection and evaluation in termperate grasses for higher fodder yield

R. 28. SBRS. Forage. 202 Introduction, evaluation and selection of superior cultivars of temperate forage crops like cloves, fodder cabbage, fodder brasier etc

R. 28. SBRS. Forage. 203 Evaluation of different cereal-legume and grass-legume mixtures for increased fodder yield and quality in the temperate condition

R. 28. SBRS. Forage. 204 Studies on the forage potential of different cereal fodders like oats, maize, barley and triticale under different manurial schedules

SCHEME FOR RESEARCH ON IMPROVEMENT OF CHILLIES, PARAMAKUDI

R. 43. Hort. 201 Evaluation of germplasm of chilli to isolate high yielding types

R. 43. Hort. 202 Evolution of high yielding gundu variety of chilli by breeding and selection

R. 43. Hort. 203 Evolving suitable management practices for cultivation of chillies in saline and alkaline soils

DEPARTMENT OF AGRICULTURAL PROCESSING

R. 1. Ag. Proc. 245 Process development of leaf protein food supplement

R. 1. Ag. Proc. 246 Utilisation of coir pith

R. 1. Ag. Proc. 249 Utilisation of agricultural waste materials for cattle feed

R. 1. Ag. Proc. 250 Processing techniques in dhal making of pigeonpea

R. 1. Ag. Proc. 253	Design and development of dehulling-cum-milling n/c for grains
R. 1. Ag. Proc. 255	Design and development of manually operated cleaner
R. 1. Ag. Proc. 256	Characteristion of leaf protein concentrate
R. 1. Ag. Proc. 257	Development of a machine for grading arecanut
R. 1. Ag. Proc. 258	Development of hand operated chilli seed extractor
R. 1. Ag. Proc. 259	Development of a husk fried drier for grains
R. 1. Ag. Proc. 260	Development of bullock powered turmeric polisher
R. 1. Ag. Proc. 261	Development of a farm level turmeric boiling unit
R. 1. Ag. Proc. 262	Studies on drying methods for pearl millet and finger millet
R. 1. Ag. Proc. 263	Process development for making boards utilising straw
R. 1. Ag. Proc. 264	Effect of processing by mechanical equipment for pearl millet and finger millet
R. 1. Ag. Proc. 265	Design and development of low-cost storage structure for grain
R. 1. Ag. Proc. 266	Optimum stage of harvest and effect of fertilizer on the yield and qualities of finger millet
R. 1. Ag. Proc. 267	Study on the effect of fertilizer and harvest on post harvest quality of pearl millet
R. 1. Ag. Proc. 268	Evaluation of storage structure for pearl millet and finger millet
R. 1. Ag. Proc. 269	Chemical control of store pests of pearl millet and finger millet
R. 1. Ag. Proc. 270	Studies on the use of plant products and inert materials for the control of store pests of pearl millet and finger millet
R. 1. Ag. Proc. 271	Biochemical qualities of peart millet, finger millet in relation to seed quality and physiological maturity
R. 1. Ag. Proc. 272	Biochemical changes in pearl millet and finger millet during storage

R. 1. Ag. Proc.	273	Design and development of farm level parboiling unit
R. 1. Ag. Proc.	274	Design and development of a fibre extractor for banana sheath
R. 1. Ag. Proc.	275	Design and development of an electrostatic seed separator
R. 1. Ag. Proc.	276	Study of dielectric properties of typical agricultural waste materials
R. 1. Ag. Proc.	284	Developmenr of a process for production of activated carbon from agricultural waste
R. 1. Ag. Proc.	285	Process development for the manufacture of glucose from sweet potato
R. 1. Ag. Proc.	286	Development of a low-cost autovat for hand made paper industries
R. 1. Ag. Proc.	287	Studies on improving the quality of paper products produced in Pilot Paper Plant
R. 1. Ag. Proc.	288	Development of a process for extraction of oil from groundnut kernels by solvent extraction method
R. 1. Ag. Proc.	289	Development of a mini burr mill for pulses
R. 1. Ag. Proc.	290	Development of a pedal operated pulse thresher-cum-decorticator

DEPARTMENT OF SOIL & WATER CONSERVATION

R. 1. SWC.	222	Development of water production function for water resources planning
R. 1. SWC.	233	Consumptive use determination of sorghum, blackgram and vegetables by neutron probe
R. 1. SWC.	234	Investigation of effective rainfall pattern on red and black soils in TNAU Campus
R. 1. SWC.	240	Methods of construction of open and tube wells and deepening the existing open wells under quicksand conditions to increase the yield
R. 1. SWC.	243	Water optimisation studies in drip irrigation
R. 1. SWC.	244	Computation of irrigation efficiencies in farmers' field

R. 1. SWC.	245	Development of water and fertilizer production functions for irrigated agriculture

DEPARTMENT OF AGRICULTURAL STRUCTURES

R. 1. Ag. St.	205	Design and development of distribution stand for low pressure pipe line irrigation system
R. 1. Ag. St.	209	Design and development of composite roofing
R. 1. Ag. St.	210	Design and development of float valve for distribution tank of underground pipe line irrigation system
R. 1. Ag. St.	213	Study and development of hydraulic design data for agricultural structures for Tamil Nadu condition
R. 1. Ag. St.	215	Design and development of type design of dairy house
R. 1. Ag. St.	218	Planning and arrangement of layout of stalls in dairy barns
R. 1. Ag. St.	219	Optimising the layout size for poultry sheds
R. 1. Ag. St.	220	Design and development of grainstorage bins

DEPARTMENT OF FARM MACHINERY

R. 1. Farm Mach.	228	Study on energy requirements for intensive crop production
R. 1. Farm Mach.	229	Survey of energy requirement
R. 1. Farm Mach.	230	Utilisation of agricultural wastes for paper and chip board manufacture
R. 1. Farm Mach.	231	Development of low-cost power-tiller
R. 1. Farm Mach.	236	Design and development of biogas operated engine
R. 1 Farm Mach.	237	A study on hydrodynamic aspects of sprayer
R. 1. Farm Mach.	238	Design and development of special purpose sprayers
R. 1. Farm Mach.	239	Study of biogas technological aspects on materials and flow
R. 1. Farm Mach.	240	Thermodynamic study in biogas plant
R. 1. Farm Mach.	241	Improvement to country plough by additional attachment

R. 1. Farm Mach.	242	Design and development of low-head high-volume pump
R. 1. Farm Mach.	243	Technoengineering study on energy in farm operations
R. 1. Farm Mach.	244	Identification of factors for energy demand in selected cultural operations
R. 1. Farm Mach.	245	Study on optimisation of energy resources for farm operations
R. 1. Farm Mach.	246	Socio-economics on energy in sample farms
R. 1. Farm Mach.	247	A study on economic feasibility of community biogas plant
R. 1. Farm Mach.	248	Design and development of a solar absorption type refrigeration system
R. 1. Farm Mach.	249	Development of a solar steam generator
R. 1. Farm Mach.	250	Design and fabrication of a suitable solar heating device for efficient production of methane gas in bio gas plant
R. 1. Farm Mach.	252	Development of a solar still
R. 1. Farm Mach.	253	Study on metallurgical and wear aspects of rotovator blades
R. 1. Farm Mach.	254	Development of suitable attachments to power tillers
R 1. Farm Mach.	255	Evaluation of Mitsubushi, Kubota and National power tillers
R. 1. Farm Mach.	258	Development of tractor-drawn bed former
R. 1. Farm Mach.	2 9	Development of seed drill attachment to bedformer
R. 1. Farm Mach.	261	Development of manually operated groundnut stripper
R. 1 Farm Mach.	262	Assessment of suitability and development of bullock drawn harvester
R. 1. Farm Mach.	263	Development of lowcost mulbery leaf cutter
R. 1. Farm Mach.	264	Development of a bullock-drawn digger for turmeric
R. 1. Farm Mach.	265	Design and development of lowcost tapioca sett cutter

R. 1. Farm Mach.	267	Design and development of firewood run IC engine
R. 1. Farm Mach.	271	Development of low-cost multicrop grain trasher
B. 1. Farm Mach.	273	Development of seed planter attachment to country plough
R. 1. Farm Mach.	274	Development of semi-mechanical wetland puddler
R. 1. Farm Mach.	275	Development of rice transplanter
R. 1. Farm Mach.	278	Design and fabrication of hand-driven coconut tree climber
R. 1. Farm Mach.	279	Development of trencher-cum-seeder
R 1. Farm Mach.	280	Development of hoe weeder for sugarcane crop
R. 1. Farm Mach.	285	Developing a cheap burner for the efficient use of *bio-gas*
R. 1. Farm Mach.	286	Purification of bio-gas
R. 1. Farm Mach.	291	Development of a tractor-drawn wide bed former-cum-seeder
R. 1. Farm Mach.	292	Modification to TNAU reaper per RNAM recommendation
R. 1. Farm Mach.	293	ORP on a) Bed-former (Tractor-drawn) b) Three tyned seed *drill (Bullock operated)* c) Weeders for garden land and wetland (Manually operated) d) Helical bladed puddler (Bullock operated e) Low-cost powertiller
R. 1 Farm Mach.	294	Harnessing wind energy for agricultural uses
R. 1. Faɹm Mach.	295	Design and development of a single bullock-drawn harvester
R. 1. Farm Mach.	296	Design and development of a bullock-drawn self propelled groundnut harvester

SCHOOL OF GENETICS, COIMBATORE

R. 1. Ag. Bo.t	101	Evaluation of germplasm bank of rice
R. 1. Ag. Bot.	104	Evaluation of the germplasm bank in sorghum

R. 1. Ag. Bot.	105	Evaluation of the germplasm bank of bajra (*Pennisetum typhoides*)
R. 1. Ag. Bot.	106	Evaluation of the germplasm bank of tenai, panivaragu and samai
R. 1. Ag. Bot.	107	Evaluation of the germplasm of varagu and ragi
R. 1. Ag. Bot	111	Cyto-taxonomical investigations in *Gossypium*
R. 1. Ag. Bot.	112	Evaluation of germplasm stocks of *Gossypium hirsutum*
R. 1. Ag. Bot.	133	Development of new male sterile lines testing their combining ability
R. 1. Ag. Bot.	205	Breeding high yielding varieties of rice with a duration of 120 to 140 days (mid duration group) with the desired plant type and superior to the existing popular strains
R. 1. Ag. Bot.	207	Breeding a rice variety with a short duration of 100 days or less and a high yield potential
R. 1. Ag. Bot.	215	Evolution of new sorghum hybirds with a duration of 85 to 90 days superior in yield to the popular hybirds for the irrigated crop
R. 1. Ag. Bot.	216	Evolution of high yielding varieties of sorghum suited to irrigated (summer) season
R. 1. Ag. Bot.	217	Development of a hybrid sorghum suited to rainfed area for the early monsoon (South-West) season with a duration of 110 to 120 days
R. 1. Ag. Bot.	218	Evolution of high yielding varieties of sorghum suited to rainfed areas for the early monsoon (South West) season
R. 1. Ag. Bot.	219	Evolution of new sorghum hybrids suited to rainfed areas for the late monsoon (North-East) season with a duration of 85 to 90 days
R. 1. Ag. Bot.	220	Breeding superior varieties of sorghum for the late monsoon season
R. 1. Ag. Bot.	222	Development of hybrids of bajra superior to HB 3 and HB4 with a duration of 85 to 90 days for irrigated and rainfed conditions
R. 1. Ag. Bot.	224	Evolution of suitable high yielding strains in ragi

R. 1. Ag. Bot.	227	Evolution of high yielding and short duration strains for varagu
R. 1. Ag. Bot.	231	Evaluation and selection of superior wheat varieties or the multiple cropping programme
R. 1. Ag. Bot.	232	Imp'ovement of Cambodia cotton (*Hirsutum*) to develop varieties superior to MCU. 5 for the winter irrigated zone
R. 1. Ag. Bot.	233	Breeding new strains of Cambodia cotton (*G. hirustum*) superior to Barathi in yield and quality for the winter rainfed areas
R. 1. Ag. Bot.	236	Breeding short duration varieties of American cotton (*G. hirsutum)* for the rice fallows
R. 1. Ag. Bot.	240	Evolution of short duration bunch strains of groundnut suitable for low rainfall areas and rice fallows
R. 1. Ag. Bot.	269	Improving the plant type and yield potential of PVR 1 and Co 25 rice
R. 1. Ag. Bct.	277	Breeding high yielding varieties of rice with a duration of 100-120 days with improved plant type
R. 1. Ag. Bot.	278	Breeding high yielding varieties of rice with a duration of 140 days and above with improved plant type
R. 1. Ag. Bot.	280	Enhancement of the yield potential through improvement of plant type in the long duration sorghum varieties Co. 1, CO 19, CO 20, K 3 and makkattai
R. 1. Ag. Bot.	284	Induction of mutation in groundnut (*Arachis hypogaea*) for isolation of economic mutants
R. 1. Ag. Bot.	285	Hybridisation between selected parents and study of pro genies for isolation of short and long duration types in gingelly
R. 1. Ag. Bot.	286	Trial of promising seed material in coconut
R. 1. Ag. Bot.	291	Induced mutagenesis for creating new spectrum of plants possessing high self-fertility, high oil yield and other economic attributes in sunflower
R. 1. Ag. Bot.	294	Building up of synthetics possessing high yield of grain and oil in sunflower

R. 1. Ag. Bot.	295	Evaluation of germplasm to understand the genetic diversity with particular reference to yield and other attributes
R. 1. Ag. Bot.	296	Development of improved strains of redgram with short, medium and long duration and yield suitable for dryland
R. 1. Ag. Bot.	297	Development of high yielding and early maturing varieties of redgram through mutation breeding
R. 1. Ag. Bot.	298	Evaluation of a high yielding variety of blackgram with improved plant type for cultivation in (i) drylands, (ii) gardenlands and (iii) rice fallows
R. 1. Ag. Bot.	299	Development of short duration varieties of blackgram with high yield potential through mutation breeding
R. 1. Ag. Bot.	300	Synthesis of a new variety of vegetable-cum-grain purpose lab lab with earliness and drought tolerance
R. 1. Ag. Bot.	301	Development of high yielding variety of greengram with improved plant type for cultivation in (i) drylands, (ii) gardenlands and (iii) rice fallows
R. 1. Ag. Bot.	302	Evolution of new varieties of greengram through mutation breeding combining earliness and high yield potential
R. 1. Ag. Bot.	303	Evolution of an early maturing and high yielding strains of bengalgram through hybridisation and mutation breeding
R. 1. Ag. Bot.	304	Development of an early maturing vegetable-cum-grain purpose cowpea suitable for both rainfed and irrigated conditions by hybridisation and mutation breeding
R. 1. Ag. Bot.	309	Evaluation of germplasm stocks of mesta (*Hibiscus cannabinus*)
R. 1. Ag. Bot.	310	Evaluation of a variety of mesta superior to the existing variety in field and quality of fibre
R. 1. Ag. Bot.	311	Evaluation of germplasm stocks of sunnhemp (*Crotalaria juncea*)
R. 1. Ag. Bot.	312	Evolution of a variety of sunnhemp (*Crotalaria juncea*) superior to the existing variety in field and quality of fibre
R. 1. Ag. Bot.	313	Spotting and exploiting of hybrid vigour in coconut

R. 1. Ag. Bot.	335	Evaluation of superior variety of jute in yield and quality of fibre
R. 1. Ag. Bot.	340	Evolution of short duration redgram varieties with high yield and reistance to wilt and root-rot and AICRIP trials
R. 1. Ag. Bot.	341	Studies on hybrid vigour, composites and evoluation of male sterile lines in lab-lab
R. 1. Ag. Bot.	342	Studies on hybrid vigour, composites and evoluation of male sterile lines in redgram
R. 1. Ag. Bot.	343	Studies on hybrid vigour, composites and evolution of male sterile lines in cowpea and bengalgram
R. 1. Ag. Bot.	344	Studies on hybrid vigour, composites and evolution of male sterile lines in greengram
R. 1. Ag Bot.	345	Studies on hybrid vigour, composites and evolution of male sterile lines in blackgram
R. 1. Ag. Bot.	350	Evolution of improved pulses varieties with multiple resistance to pests, diseases and tolerance to adverse soil and climatic conditions
R. 1. Ag. Bot.	360	Breeding a hybrid cotton for rainfed tract of Tamil Nadu
R. 1. Ag. Bot	361	All India Co-ordinated Research Project on Soybean
R. 1. Ag. 8ot.	362	Building up and maintenance of a geno pool composed of a randomly interbreeding individuals known as Panmixis population in tetraploids in Gossypium
R. 1. Ag. Bot.	363	Adhoc trials and plot demonstration trials of All India Co-ordinated Cotton Improvement project
R. 1. Ag. Bot.	364	Evolving new barbadense cotton variety
R. 1. Ag. Bot	366	Maintenance and evaluation of genetic stocks of *G. barbadense*
R. 1. Ag. Bot.	367	Study of mutagensis in cotton
R. 1. Ag. Bot.	368	Synthesising an intraspecific hybrid cotton
R. 1. Ag. Bot.	369	Evaluation of breeding methods in cotton
R. 1. Ag. Bot.	370	All India Co-ordinated Cotton Improvement Project trials on irrigated *hirsutum* varieties

R. 1. Ag. Bot.	372	Varietal trials of rainfed cotton under AICCIP
R. 1. Ag. Bot.	373	Genetic study on the effect of bi-parental matting on cotton (*G. hirusutum*) hybrids
R. 1. Ag. Bot.	375	Development of peas and beans suitable for cultivation in plains
R. 1. Ag. Bot	376	Evaluation of germplasm in greengram
R. 1. Ag. Bot	377	Study of heterosis in Greengrom (*Vigna radiate*)
R. 1. Ag. Bot.	378	Evaluation of germ plasm in bengalgram
R. 1. Ag. Bot.	379	Evolution of high yielding varieties of bengalgram through mutation breeding
R. 1. Ag. Bot.	380	Evaluation of germplasm in lab lab
R. 1. Ag. Bot.	381	Evolution of high yielding vegatable cum-grain purpose lab lab through mutation breeding
R. 1. Ag. Bot.	382	Evolution of high yielding field lab lab
R 1. Ag. Bot.	383	Evaluation of germplasm in horse gram
R. 1. Ag. Bot.	384	Evolution of high yielding varieties in horse gram
R. 1. Ag. Bot.	385	Evolution of high yielding varieties of cowpea for dry-lands through conventional breeding
R. 1. Ag. Bot.	386	Evaluation of germplasm in cowpea
R. 1. Ag. Bot.	387	Evolution of high yielding varieties of cowpea for dry-lands through mutation breeding
R. 1. Ag. Bot.	388	Evaluation of germplasm in soybean
R. 1. Ag. Bot.	389	Evolution of high yielding varieties of soybean through mutation breeding
R. 1. Ag. Bot.	390	The inter-relationship between genotypes and environment in relation to productivity in sunflower
R. 1. Ag. Bot.	391	Breeding methodology in sunflower
R. 1. Agr Bot.	392	Exploitation of Heterosis in Sesamum
R. 1. Ag. Bot.	393	Exploitation of induced variability in groundnut improvement

R. 1. Ag. Bot.	394	Synthesis of polyploids in Arachis and their utilization
R. 1. Ag. Bot.	395	Screening and breeding rice varieties resistant to brown spot
R. 1. Ag. Bot.	396	Improvement of existing downy mildew resistant varieties of maize for yield and suitability to rainfed farming system of Tamil Nadu
R. 1. Ag. Bot.	397	Development of superior cumbu population including the improvement
R. 1. Ag. Bot.	398	Inducing variability through mutagensis in ragi
R. 1. Ag. Bot.	399	Development of maize varieties / composites / hybrids suitable for Tamil Nadu
R. 1. Ag.Bot.	400	Scheme for development of Hybrid rice
R. 1 Ag. Bot.	401	Genetic analysis of resistance and mechanism of transfer of genes conferring resistance to rust disease in groundnut
R. 1. Ag. Bot.	402	Generating segregating populations of gingelly (sesamum indicum L) and studying the effect of selection
R. 1. Ag. Bot.	403	Interspecific gene transference in *Arachis, Sesamum Vigna* and *Cajanus*

DEPARTMENT OF FORAGE CROPS, COIMBATORE

R. 1. Forages	201	Breeding superior Forage sorghum through interspecific hybridisation for irrigated and rainfed trials
R. 1. Forages	203	Introduction and evaluation of varieties of plant materials likely to be useful and as fodder and forage crops
R. 1. Forages	204	Synthesis of new varieties in Cumbu Napier (*Pennisetum typhoides* × *P. Purpureum*) and assessment of existing ones for fodder
R. 1. Forages	205	Evaluation and selection of seedling progenies in guinea grass *P. maximum* for maximum yield
R. 1. Forages	206	Breeding superior varieties of Kolukkatti (Buffel grass) *Cenchrus sp.* and assessing their fodder potential under rainfed condtions in the State
R. 1. Forages	211	Studies in Forage potential of *Leucaena leucocephala*

R. 1. Forages	212	Evaluation of *Stylosanthes* sp. for yield and quality of fodder
R. 1. Forages	213	Evaluation and mutation breeding in cultivated and wild species of Dolichos for fodder yield and quality
R. 1. Forages	214	Evaluation and induced mutagenesis of spear grass (*Heteropogan contortus*) and marvel grass (*Dicanthium annulatum*) and evolvings superior forage types
R. 1. Forages	215	Breeding superior forage maize varieties and hybrids
R. 1. Forages	216	Breeding selection and introduction in *Clitoria ternatea* and *Desmodium* sp
R. 1. Forages.	217	Evolving package of practices for Leucaena
R. 1. Forages.	218	Production potential of forage crops
R. 1. Forages	219	Evaluation of better forage cereals, grasses and legumes through quality characteristics
R. 1. Forages	220	Studies on the effect of fertilization and stages of cutting in forage cereals and grasses
R. 1. Forages	221	Effect of nitrogen application on accumulation of nitrogen in fodder crops
R. 1. Forages	222	Production of superior synthetic and composite varieties in Lucerne
R. 1. Forages	223	Evaluation and selection in forage grasses inculding cereal fodder under AICORF programme
R. 1. Forages	224	Evaluation and selection in forage legumes and other miscellaneous fodder crops under AICORF programme
R. 1. Forages	225	Studies on the cutting management in fodder trees
R. 1. Forages	102	Studies on age of cutting on forage nutrition value by in vitro fermentation technique
R. 1. Forages	103	Estimation of structural carbohydrates and in vitro digestibility of organic matter of leguminous crops

DEPARTMENT OF ANIMAL GENETICS

R. 25. AG.	107	Biochemical polymorphism in south Indian sheep breeds

R. 25. AG.	108	Haemoglobin polymorphism in Rambouillet X Nilagiri crossbred sheep
R. 25. AG.	109	Assessment of evaporation of liquid nitrogen refrigerator stored at climatic conditions of Madras
R. 25. AG.	110	Genetics of blood potassium in south Indian sheep
R. 25. AG.	111	Genetic studies on esterase in sheep breeds of Tamil Nadu
R. 25. AG.	112	Genetics of erythrocyte potassium in murrah buffaloes
R. 25. AG.	204	Investigation into quantitative aspects of vit. A. Carotene, deoxyribonucleic acid and ribonucleic acid of burralo semen
R. 25. AG.	205	Chromosomal studies in domestic animals and human beings
R. 25. AG.	206	Egg protein polymorphism in poultry
R. 25. AG.	207	Selection for carcass quality in broilers based on live grading
R. 25. AG.	208	Comparative merits of medium and mini straws for freezability and fertility of bull semen
R. 25. AG.	209	Deep freezing of ram semen
R. 25. AG.	210	Genetic studies on selection against lymphamatosis in leghorn
R. 25. AG.	211	Comparative study on the revival and fertility rate of murrah buffalo sperm frozen in smaller and larger capillary tuning at - 196 C
R. 25. AG.	212	Studies on the influence of seasons and period of oestrus on the conception rate in crossbred cattle in Madras city
R. 25. AG.	213	Effect of tris, Sodium citrate and lactose dilnent on cytomorphology of bull sperm during storage
R. 25. AG.	214	Deep freezing of buffalo semen under field conditions

DEPARTMENT OF ANATOMY

R. 25. Anat.	201	Histological studies on the skin of cattle

R. 25. Anat.	202	Studies on the histology of gall bladder of the Indian buffalo (Bubalus bubalis)
R. 25. Anat.	203	Studies on the Anatomy and Cytoarchitectue of the cerebral cortex of the Indian buffalo
R. 25. Anat.	204	Studies on the histology of the tongue of the Indian buffalo - (Bubalus bubalis)
R. 25. Anat.	205	Study on the presence of "Mast cells" in the salivary glands of Indian buffalo (Bubalus bubalis)
R. 25. Anat.	206	Study on the gross anatomy of the larynx of the Indian buffalo (Bublus bubalis)

DEPARTMENT OF DAIRY SCIENCE

R. 25. DS.	101	Study on the influence of season on fat and S.N.F. content of pooled milk from cross bred cows
R. 25. DS.	102	Studies on the buffering value of milk and its relationship on its keeping quality
R. 25. DS.	104	Studies on the calcium and phosphorus content in milk of cross bred cows maintained in Model Dairy, Madras Veterinary College
R. 25. DS.	105	A comparative study of the reduction times of (a) 2, 3, 5 triphenyl tetrazolium chloride, (b) methylene blue and (c) Resazurin on pooled milk samples
R. 25. DS.	106	Studies on the rancidity in fresh milk

DEPARTMENT OF EXTENSION

R. 25. Extn.	101	Awareness of disease prevention measures among livestock farmers
R. 25. Extn.	203	An expost facto study of the existing management practices of new born white and black cattle upto heifer stage in Madrae city
R. 25. Extn.	207	A study on factors and agencies responsible for the spread of hybrid bird rearing
R. 25. Extn.	208	Training needs of Veterinary Assistant Surgeons and Officers of Animal Husbandry Department

R. 25. Extn.	209	Detoxification of Aflatoxin in G.N. Cake
R. 25. Extn.	210	Evaluation of farmer's training programme
R. 25. Extn.	211	Economics of babcock layer farm of the extension co-operators of Vyasarpadi
R. 25. Extn.	212	Adoption problems of small farmers in dairying
R. 25. Extn.	213	Economics of broiler production by the Extension Co-operators in Vyasarpadi
R. 25. Extn.	214	Estimation of diffusion of modern practices in A.I. in the adopted villages and in and around Madras city

DEPARTMENT OF ANIMAL HUSBANDRY ECONOMICS

R. 25. AH. Econ.	2	Dairy production and marketing decisions at farm level

DEPARTMENT OF HYGIENE

R. 25. Hyg.	102	Designing of animal houses
R 25. Hyg.	109	Study of noise pollution in relation to egg production and health in layer houses
R. 25. Hyg.	110	Study on the effect of aerosol disinfection of atmospher

DEPARTMENT OF LABORATORY ANIMAL MEDICINE

R. 25. L.A.M.	201	Study on the normal haemogram of laboratory animals
R. 25. L A.M.	202	Study on the common diseases of laboratory animals and their control
R. 25. L A.M.	203	Egg quality studies in quails

DEPARTMENT OF MEATS

R. 25. MH.	103	Study on the preparation and shelf-life of vinegar pickled pig feet
R. 25. MH.	105	Enzymatic tenderisation of mutton
R. 25. MH.	106	Studies on the packaging ahd marketing of pork
R. 25. MH.	108	Studies on the rendering and keeping quality of lard
R. 25. MH.	203	Studies on the preparation of Salami sausage

R. 25. MH.	204	Studies on the marketing of integrated meat
R. 25. MH.	205	Studies on the preparation of mutton sausage
R. 25. MH.	206	Studies on the quality of hog casings treated with chemicals

DEPARTMENT OF MICROBIOLOGY AND BIOCHEMISTRY

R. 25. MB.	104	Studies on immunogenicity of CDF 66 lentogenic strain of Ranikhet Disease virus (RDV) in comparison to F & K strains of RDV
R. 25. MB.	106	Ontogeny of immune response on chicks to antigens
R. 25. MB.	109	Cultivation of ovine strain of *Hycobacterium Paratuberculosis*
R. 25. MB.	110	Optimum time of vaccination and route of inoculation of chicks with lentogenic virus strains of ranikhet disease virus vaccine
R. 25. MB.	111	Salmonellosis in poultry
R. 25. MB.	112	Isolation and characterisation of lentogenic and mesogenic strains of ranikhet disease virus and study of their immunogenicity in fowls
R. 25. MB.	113	Bacteriologic and immunoglogic studies of septicaemic and enteric infection of calves
R. 25. MB.	114	Diagnosis of bovine brucellosis by indirect haemolysis
R. 25. MB.	115	Studies on the microflora of persistent wound infections on animals and their antibiogram
R. 25. MB.	116	Basis of immune tolerance and immune paralysis in fowls
R. 25. MB.	117	Adaptation of ranikhet disease virus (vaccine strain-K) in tissue culture
R. 25. MB.	202	Assessment of immunity of poultry for ranikhet disease in Madras
R. 25. MB.	205	Epidemiology of coliform contamination in milk with particular reference to enterotoxigenic *ezcherichia coli*
R. 25. MB.	206	*Eschericha coli* Enterotoxin in milk and meat

R. 25. MB.	207	Rapid diagnostic methods for isolation and identification of *Bacillus anthracis* from animal by-products
R. 25. MB.	208	Bacterial etiology of perinatal lamb mortality
R. 25. MB.	209	Bacterial flora of unhatched eggs
R. 25. MB.	210	Coliform Mastitis
R. 25. MB.	211	Immunopathegenicity of *brucellia abortus* in animals
R. 25. MB.	213	Efficiency of auto vaccines in the therapy of bovine cutaneous papilloma
R. 25. MB.	214	Screening poultry meat for food poisoning microbas with special reference to *salmonella species*

DEPARTMENT OF OBSTETRICS

R. 25. OG.	104	Vitamin 'A' estimation on anoestrus she buffaloe
R. 25. OG.	105	Electron microscopic study of the normal and abnormal buffalo sperms with reference to infertility
R. 25. OG.	107	Induction of lactation in non pregnant sterile animals
R. 25. OG.	207	Electron microscopic studies on buffalo testis

DEPARTMENT OF PARASITOLOGY

R. 25. Para.	106	Studies on the incidence of various species of insects affecting livestock in and around Madras city
R. 25. Para.	108	Studies on the ecology of Argasid ticks with special reference to the genus Argas
R. 25. Para.	110	Studies on tickicides
R. 25. Para.	112	Review of literature on the vectors of the tape worms of ruminants
R. 25. Para.	113	Studies on pasture contamination of oribatid mites at Live-Stock Research Station, Kattupakkam and Madras Veterinary College, Madras
R. 25. Para.	114	Study of cercarial fauna (pertaining to duck treamatodes) of fresh water snails collected from water sources frequented by ducks
R. 25. Para.	115	Studies on the viscerotropic migration of irradiated ancylostome larvae in laboratory animals

R. 25. Para.	116	Survey of parasitic infection in pigeons
R. 25. Para.	201	To cultivate *theileria annulate* schizont infected lymphoid cell in the laboratory and to sub-culture it serially to develop a vaccine against homologus strain
R. 25. Para.	202	Electron microscopic studies of protozoan parasites
R. 25. Para.	204	Survey of amphistome parasites of ruminants
R. 25. Para.	205	Studies of cestodes of ruminants in Tamil Nadu

DEPARTMENT OF PATHOLOGY

R. 25. Path.	104	Study of neoplasms of upper respiratory tract in bovines
R. 25. Path.	107	Study to detect the presence of antinuclear antibody in sinus tumour animals
R. 25. Path.	108	Studies on exfoliative cytology in neoplasm of upper respiratory tract by indirect fluorescent antibody test
R. 25. Path.	109	Sur5ey of the incidence of neoplasms in the upper respiratory tract in bovines belonging to livestock farms in Tamil Nadu
R. 25. Path.	110	Studies on perinatal mortality in lambs
R. 25. Path.	111	Enteropathology of equines
R. 25. Path.	112	An evaluation of trypsin deficiency in canine pancreatic disorders
R. 25. Path.	113	Pathology of abomasum and duodenum in cattle
R. 25. Path.	114	Comparative cytology of neoplasms in animals by acridine orange and papanicoloau stains
R. 25. Path.	115	Pathology of liver in broiler chicksns
R. 25. Path.	116	Karyotyping studies on transmissible veneral tumour
R. 25. Path.	204	Histopathology of spontaneous cases of upper respiratory tract in bovines in Tamil Nadu
R. 25. Path.	205	Histopathological study of liver diseases of bovines in Tamil Nadu

R. 25. Path.	208	Histopathological surveys of pulmonary lesions in bovines
R. 25. Path.	209	Studies on pulmonopathy in bovines in Tamil Nadu
R. 25. Path.	212	Gross and histopathology in canine ehrilchiosis
R. 25. Path.	213	Hamemogram in canine ehrilichiosis
R. 25. Path.	214	Study of serum protein pattern by electrophoresis in sinus tumour animals
R. 25. Path.	215	Passive haemagglutination in detection of antibodies in bovine sinus enoplasm
R. 25. Path.	216	Diagnosis of ethmoidal tumours by mucus cell blocks

DEPARTMENT OF PHARMACOLOGY

R. 25. Pharm.	205	Investigation of the effect of *Gotalaraja juncea* on the reproductive function
R. 25. Pharm.	209	Drug interaction studies on metamizole, cyproheptadine and phenobarbitone sodium in tats
R. 25. Pharm.	210	Haematological effects of paracetamol in laboratory mouse

DEPARTMENT OF PREVENTIVE MEDICINE

R.25.Pre. Med.	103	Accredited and certified herd schemes
R.25.Pre. Med.	107	A study on the usefulness of infected gums for confirming rinderpest in bovines
R.25.Pre. Med.	108	Assessment of immunity in vaccinated dogs against Rabies by electrophoretic studies
R.25.Pre.Med.	111	Study on the incidence of bovine vibriosis in cattle
R.25.Pre. Med.	112	A survey of pullorum disease in poultry in and around Madras city
R.25.Pre. Med.	202	Diagnosis of rabies in live animals and man by examination of coreneal impression smear by FAT
R.25.Pre Med.	205	An investigation of the causes of enteritis in calves in and around Madras city

R.25.Pre.Med.	206	Field trials for the evaluation of stormont test for diagnosis of tuberculosis
R.25.Pre.Med.	297	Trials on vaccination of dogs against ticks.

DEPARTMENT OF POULTRY SCIENCE

R. 25. P. Sc.	106	Quality of eggs stored at room temperature through the year
R. 25. P. Sc.	107	Comparative assessment on the preservation of shell egg
R. 25. P. Sc.	108	Effect of position of egg during incubation to improve hatchability
R. 25. P. Sc.	109	Studies on the quality of market eggs in the city of Madras
R. 25. P. Sc.	110	Rice polishings as a replacer for maize in broiler ration
R. 25. P. Sc.	111	Studies on the effect of Liv. 52 powder supplementation in broiler diet
R. 25. P. Sc.	112	Different methods of preservation of table eggs
R. 25. P. Sc.	114	Effect of cold storage on the quality of eggs
R. 25. P. Sc.	201	Effect of inclusion of marigold flower meal in practical poultry ration on broiler meat appearance and intensity of yolk color.

DEPARTMENT OF PHYSIOLOGY

R. 25. Phy.	204	Effects of pancreatic stimulants of serum amylase activity in dogs
R. 25. Phy.	205	Source and distribution of serum amylase in dogs
R. 25. Phy.	217	Determination of levels of transmiseases and alkaline phosphatase in serum of dairy cattle
R. 25. Phy.	206	Alakaline phosphatase activity at differant ages in wheep in health and disease
R. 25. Phy.	203	Sialic acid level at different ages in domestic fowl
R. 25. Phy.	207	Electrophoretic studies of serum amylase in cattle
R. 25. Phy.	208	Standardising a technique for collecting semen from rams by electro-ejaculation
R. 25. Phy.	209	Serum amylase and blood glucose levels in cattle

R. 25. Phy.	210	Serum amylase level and blood glucose levels in sheep
R. 25. Phy.	211	Blood ketones in lambs
R. 25. Phy.	212	Levels of blood copper and blood urea nitrogen in health and disease in lambs
R. 25. Phy.	?13	Studies on the physiology of male reproductive organs - Antifertility effect of chlorohydrin and ethelenechlorohydrin on male rats
R. 25. Phy.	214	The role of pineal glands on reproduction
R. 25. Phy.	104	Rumen metabolism in goats

DEPARTMENT OF SURGERY

R. 25. S.	101	Radiological studies in case of neoplasms of ethmoidal mucosa in bovines
R. 25. S.	102	Study on the efficacy of ultrasonic message on the udder tissue in bovine mastitis
R. 25. S.	104	Studies on teat strictures in bovines
R. 25. S.	106	Studies on the use of cryosurgery in cutaneous and granulomatous neoplasms in bovines
R. 25. S.	107	Radiological diagnosis of diaphragmatic hernia in bovines
R. 25. S.	108	Diathermy an additional treatment for pneumonia and chest conditions in cattle
R. 25. S.	109	Studies on the use of bovine fibrin haemastatasis in haemotoma in ear of canines
R. 25. S.	110	Studies on the use of Diazepam as a preanaesthetics in felines
R. 25. S.	111	Analysis of cerebrospinal fluid in neurological diseases of cattle
R. 25. S.	112	Studies on the genetic structure of Sindhi herd at Hosur Cattle Farm (Tamil Nadu)
R. 25. S.	202	Surgical treatment of transmissible venereal tumours in bitches
R. 25. S.	203	Studies on the treatment of otitis with Bacteriosol.

DEPARTMENT OF THERAPEUTICS

R. 25. Ther.	103	Nivaquine therapy in bovine Theileriasis
R. 25. Ther.	104	Survey of etiology and seasonal variation of bovine indigestion in Madras city.

R. 25. Ther.	105	Assess the efficacy of newer antifroathing agents
R. 25. Ther.	201	To study the incidence of nitrate toxicity in cattle in and around Madras city
R. 25. Ther.	203	Efficacy of Samorin (M & B) in bovine Trypanosomasis.

POULTRY RESEARCH STATION, MADRAS

R. 34. PRS.	106	Studies on social behaviour of broiler breeders
R. 34. PRS.	'08	Investigation of immunological status of birds vaccinated against Ranikhet disease
R. 34. PRS.	110	Artificial insemination in poultry
R. 34. PRS.	114	Studies on the relationship between shape and size of egg with hatchability, chick weight and sex of chicks
R. 34. PRS.	116	Effect of strain and age on egg quality traits
R. 34. PRS.	117	Effect of feeding greens on hatchability in white leghorn layers
R. 34. PRS.	118	Studies on correlation between egg weight and 4, 6 and 8th week body weight in broiler chicken
R. 34. PRS.	120	Utilisation of shank and head for soup preparation
R. 34. PRS.	206	Economics of raising broiler chicks
R. 34. PRS.	208	Effect of certain additives on hatchaility of broilers
R. 34. PRS.	213	Studies on the effect of position of hatching eggs during storage period on hatchability in white rock breed
R. 34. PRS.	214	Effect of different levels of tannin of raw tamarind seed original choice diets on their performance
R. 34. PRS.	215	The effect of stocking density on layer performance
R. 34. PRS.	216	Effect of sheele chlorine solution for disinfection of drinking water on broiler performance
Project No. not assigned		Effect of 'Emtryl' on laying performance of white leghorn birds.

LIVESTOCK RESEARCH STATION, KATTUPAKKAM

R. 33. LRS.	109	Studies on the rerationship between dam's weight at mating and birth weight of lambs in Madras red

13. Distribution pattern of fish catches in mechanized and non-mechanized boats
14. Economics of brackishwater fish culture
15. Formulation of prawn feed
16. Solar drier for fish drying
17. Selectivity of gill nets for reservoirs
18. Fish behaviour in relation to gear
19. Seasonal changes in biochemical composition of livers in sharks
20. Storage characteristics of frozen prawns
21. Pathogenic organisms in processed fishery products
22. Biological recycling of industrial waste waters
23. Fouling problems of cooling towers and utilization of effluents
24. Chemical composition of sea weed
25. Physico-chemical characteristics of fish protein
26. Effect of fouling and boring organisms in the fishing crafts of Tuticorin
27. Fish eggs and larvae of Tuticorin
28. Benthic population of Tuticorin
29. Resource characteristics of fresh water prawn
30. Phosphorus enrichment through pollution
31. Some physico-chemical parameters in Tuticorin waters
32. Energy flow in Korampallam lake
33. Limiting nutrients in lentic and lotic waters
34. Chronological study on fish growth
35. Calorific values of fishes
36. Copper in the food chain of Tuticorin waters
37. "I lakkiathil Meenvalam"
38. "Meenkalaisar Akarathi"
39. Biology of some bivalves of Tuticorin
40. Pollution monitoring studies

DEPARTMENT OF ANIMAL HUSBANDRY, COIMBATORE

R. 1. A. H.	224	Micro-mineral requirements and their association with growth rate on calves
R. 1. A. H.	225	Cost of rearing crossbred calves at Tamil Nadu Agricultural University
R. 1. A. H.	226	Feeding trials on cost of milk production of cows by giving roughage and low concentrates
R. 1. A. H.	227	Studies on reproductive disorders in dairy cows
R. 1. A. H.	228	Studies on the economic traits of Malabari goats under semiintensive system
R. 1. A. H.	229	To study the incidence of sub-clinical mastitis in the dairy unit
R. 1. A. H.	231	Studies on the level of feeding of lucerne meal in broiler ration
R. 1. A. H.	232	Influence of calcium and prosphorus levels in blood and reproduction in dairy cows
R. 1. A. H.	233	Forced mating of spent layers after one year of production

FISHERIES COLLEGE, TUTICORIN

1. Mariculture of fishes and prawns
2. Brackishwater pen culture
3. Culture of crab *Scylla serrata* (C.S.I.R.)
4. Mass rearing of larvivorous fishes (I.C.M.R.)
5. Culture of *Macrobrachium* spp
6. Fish seed resources of Kanyakumari and Tirunelveli districts
7. Cage culture of fishes
8. Brackishwater fish and prawn culture
9. Operational Research Project on fish culture
10. Artemia culture
11. Composite fish culture (I.C.A.R.)
12. Culture of mullets

13. Distribution pattern of fish catches in mechanized and non-mechanized boats
14. *Economics of brackishwater fish culture*
15. Formulation of prawn feed
16. Solar drier for fish drying
17. Selectivity of gill nets for reservoirs
18. Fish behaviour in relation to gear
19. Seasonal changes in biochemical composition of livers in sharks
20. Storage characteristics of frozen prawns
21. Pathogenic organisms in processed fishery products
22. Biological recycling of industrial waste waters
23. Fouling problems of cooling towers and utilization of effluents
24. Chemical composition of sea weed
25. Physico-chemical characteristics of fish protein
26. Effect of fouling and boring organisms in the fishing crafts of Tuticorin
27. Fish eggs and larvae of Tuticorin
28. Benthic population of Tuticorin
29. Resource characteristics of fresh water prawn
30. Phosphorus enrichment through pollution
31. Some physico-chemical parameters in Tuticorin waters
32. Energy flow in Korampallam lake
33. Limiting nutrients in lentic and lotic waters
34. Chronological study on fish growth
35. Calorific values of fishes
36. Copper in the food chain of Tuticorin waters
37. "I lakkiathil Meenvalam"
38. "Meenkalaisar Akarathi"
39. Biology of some bivalves of Tuticorin
40. Pollution monitoring studies

2.	Studies on variability, association, path analysis and genetic divergence in green gram *(Vigna radiata* L) Lilczek.	P. Boomikumaran	Dr. M. Rathinam
3.	Genetic analysis of some quantitative characters in forage sorghum (*Sorghum bicolor* L Moench)	N.R. Chandrasekaran	Dr. P. Chandrasekaran
4.	Studies on genetic divergence in ragi (*Eleusine Coracana* L *Gaertn)* for yield of fodder	C.V. Dhanakodi	Dr P. Chandrasekaran
5.	Evaluation of biparental progenies in cotton (*Gossypium hirsutum* L)	A. Jayaraman	Dr. R. Krishnaswami
6.	Genetic analysis of yield and its components in groundnut *(Arachis hypogaea* L)	R. Jayaraman	Dr. R. Appadurai
7.	Studies on variability and genetic diversity for fodder characteristics in lab lab bean (*Lablab purpureus* L) Sweet	V. kodeswaran	Dr. M. Balasubramaniam
8.	An evaluation of combing ability and heterosis in Mung bean *(Vigna radiata* L *Wilczek)*	S. Manamohanlal	Prof A. Subramanian
9.	Biometrical analyais of the three characters and their influence on floss yield in kapok (*Ceiba pertandra* L *Gaertn*)	C. Natarajan	Dr. M. Rathinam
10.	Genetical analysis of yield and yield componerts in F_1 and F_2 generations of sesamum (*Sesamum indicum* L)	K. Paramasivam	Dr. M.N. Prasad

11.	Studies on heterosis and combing ability in safflower *(Carthamus tinctorius* L)	R.S. Purushothaman	Dr. R Appadurai
12.	A Comparative study for breeding value of safflower genotypes under two enve-rionments	B. Subbulakshmi	Dr. V. Sivasubramanian
13.	Studies on the induced poly-genic mutations in M_3 and M_4 generations of rice (*Oryza sativa* L)	C.R. Anandakumar	Dr. V.D. Gurusamy Raja
14.	Biometrical studies in hor-segram (*Dolichos biflorus* L)	A. Balan	Dr. V.D. Gurusamy Raja
15.	Diallel analysis of yield and its components in Okra *(Abel-moschus esculentus* L Moench)	Culthbert Jais Joseph	Dr V.D. Gurusamy Raja
16.	Studies on induced muta-genesis in *Sorghum bi-color* L. Moench with ga-mma rays and methyl me-thane sulphonate.	P. Gomathinayagam	Dr. S. Rajasekaran
17.	Studies on heterosis and combing ability in upland cotton (*Gossypium hirsu-tum L.)*	N. Jayaraman	Dr. V. D. Gurusamy Raja
18.	Studies on induced muta-genesis in Bhendi (*Abel-moschus esculentus Mo-ench)* with gamma rays and ethyl methane sulpho-nate.	R. Jeevanandam	Dr. S. Rajasekaran
19.	Studies on variabilibity, D^2 statistic and correlation in sesamum (*Sesamum in-dicum L.)*	M. S. Thangavelu	Dr. S. Rajasekaran

AGRONOMY

Ph. D.

1.	Effect of mulching on sorghum Co 21 under conventional and no tillage systems	R. Kaliappa	Dr. Y. B. Morachan
2.	Studies on geometry of planting, defoliation and nitrogen management in sunflower.	J. Krishnarajan	Dr. Y. B. Morachan
3.	Studies on the association of perennial grass (NB21) legume (lucerne) mixture on the forage yield and quality.	V. S. Shanmuga sundaram	Dr. Y. B. Morachan

M. Sc. Ag.

1.	Effect of crop geometry and nitrogen level on cotton (*Gossypium hirsutum L.*)	C. Aravind Balu	Dr. M. R. Iruthayaraj
2.	Parallel and relay intercropping in rainfed redgram (Co 3).	N. Asokaraja	Dr. S. Ramiah
3.	Nitrogen and herbicide management under different planting systems with carbofuran application in lowland rice (IET 1444).	P. Balasubramanian	Dr. Y. B. Morachan
4.	Nursery management in rice	M. N. Badhar	Dr. S. P. Palaniappan
5.	Studies on cropping systems for ranifed black soil area in North - east monsoon season.	R. Elangovan	Dr. S. P. Palaniappan
6.	Studies on the influence of season, spacing and nitrogen on maize, sorghum and ragi	P. Gnanamurthy	Dr. M. R. Iruthayaraj

7.	Studies on time of sowing with different quentities of rainfall and nitrogen fertilization of rainfed sorghum and its ratoon crop	G. James Martin	Dr. Y. B. Morchan
8.	Integrated nitrogen management in lowland rice with biofertilizers	S. Mahendran	Dr. S. Ramiah
9.	Studies on the effeet of irrigation and growth regulators on blackgram *Vigna-mungo L Hepper*) and green gram (*Vigna radiata L. Wilczek*	k. M. Nagarjan	Dr. S. Ramiah
10.	Relay cropping of black-gram varieties (*Vigna, mungo L Hepper*) in rice	K. Panneerselvan	Dr. S. Ramiah
11.	Effect of premonsoon sowing, depth of seed placement and seed hardening and rainfed sorghum	C. Periyathambi	Dr. S. P. Palaniappan
12.	Studies an the effect of irrigation regimes and mulches on sorghum Co 23	M. Premsekhar	Dr. M. R. Iruthayaraj
13.	Interaction effect between soil and applied pesticides and fertilizer nitrogen on lowland rice	K. Sathasivan	Dr. S. P. Palaniappan
14.	Studies on fixing optimum leaf area index in rice (IR 20)	N. Sekhar	Dr. Y. B. Morchan
15.	Effect of planting methods on growth and yield of rainfed sorghum varieties	P. Thangaraja	Dr. S. Ramiah
16.	Studies on the influence of agronomic method and plant density on MCU 9 Cotton	R. Venkataswamy	Dr. M.R. Iruthayaraj

17.	Studies on the effect of time of sowing and irrigation on growth and yield of rice (IR 20)	A. Balakrishnan	Dr. K.K. Subbiah
18.	Studies on scheduling irrigations to pearl millet at different growth stages and its influence on yield and yield attributes.	B. Gururajan	Th. V. Subbiah
19.	Time and methods of phosphorus application on yield and yield components of rice varieties.	S. Jeyaraman	Dr. K K. Subbiah
20.	Studies on the effect of intercropping in maize under different nitrogen levels.	A. Kaliyaperumal	Dr. K. K. Subbiah
21.	Effect of spacing, nitrogen and potassium on MCU. 1. onion (*Allium cepa L.* var. *aggregatum* Don.)	V. K. S. Kannivel	Dr. K. K. Subbiah
22.	Effect of moisture stress and phosphorus fertilization on growth, yield and yield components of sunflower (*Helianthus annus L.)*	R. Murugaprabhu	Th. V. Subbiah
23.	Influence of transplanting under carbofuran and neemcake applications on shoot fly incidence, growth, yield and yield components of sorghum hybrid CSH 1.	P. Natarajan	Dr. K. K. Subbiah
24.	Studies on the effect of different irrigation regimes on growth yield components and yield of rice. (*Oryza sativa L.)*	M. Pichai Pillai	Th. V. Subbiah

25. Effect of phosphorus and potassium levels under varied spacings on growth, yield and yield components of MDU. 1. Brinjal *(Solanum, melongena L.)*	E. Rajan Ravi chandran	Th. S. Kolandaiswamy
26. Studies on intercropping under different levels of nitrogen in Bajra Co 8.	S. M. Shahul Hameed	Th. S. Kolandaiswamy
27. Effect of moisture stress and phosphorus levels on CO 4 blackgram. (*Vigna mungo Roxb.*)	N. D. Vijayakumar	Dr. K. K. Subbiah

SOIL SCIENCE AND AGRICULTURAL CHEMISTRY

Ph. D.

1. Studies on fixation, transformation and availability of applied phosphorus in rice soils of Tamil Nadu.	K. Kumaraswamy	Dr. U. S. Sree Ramulu
2. Effect of salinity levels on maize and cotton and changes in soil properties.	P. C. Meenakshi sundaram	Dr. K. K. Krishna moorthy
3. Studies on the dynamics of disulfoton in soils and its effect on soil biological processes.	Paban kumar Bordoloi	Dr. G. Oblisami

MSc. (Ag)

4. Studies on the effect of sub soil compaction on the physico-chemical properties of soil and yield of Ganga 5 maize.	V. Durairajan	Dr. K. M. Ramanathan
5. Effect of continuous cropping and fertilization on the availability and uptake of nutrients.	N. Kanakabhushani	Th. C. K. Rajagopal

6.	Studies on the factors influencing the nutritive value of rice bran and the quantity and quality of rice bran oil.	V. V. Krishnamoorthy	Dr. U. S. Sree Ramulu
7.	The copper nutrition in ragi CO 11. (*Eleusine, coracana Gaertn)* in Nilgiris soils.	H. B. Mathan	Th. C. K Rajagopal
8.	Studies on potassium in major soil series of Coimbatore district. (Tamil Nadu.)	S. Natarajan	Dr. K. M. Ramanathan
9.	Studies on the analytical storage stability and compatibility of certain pesticides.	R. Natesan	Dr. U. S. Sree Ramulu
10.	Studies on the effect of NPK on the yield, oil content and quality of oil in sunflower (*Helianthus annuus L.*)	S. Palanivel	Dr. K. M. Ramanathan
11.	Response of soybeam varieties to application of manganese, zinc and molybdenum.	R. Pandian	Dr. G. Ramanathan
12.	Studies on the influence of the physicochemical properties on the Evalues of soils of Tamil Nadu.	R. Surendiran	Dr. U. S. Sree Ramulu
13.	Effect different sources of organic matter on the availability of iron in black and red soils.	S. Thiagarajan	Th. C. K. Rajagopal
14.	Studies on the response of gingelly crop (*Sesamum indicum L.*) to application of micronutrients.	A. Vadivel	Dr. G. Ramanathan

15.	Evaluation of selected soil test methods and crop response studies for potasium with rice	P. S. Nagarajan	Dr. C. S. Balasundaram
16.	Study on the physico-chemical properties of the coffee soils of lower Pulneys (Madurai District) and the relationships among the mineral elements in coffee leaves	K. Ponniah	Dr. G. V. Kothanda raman
17.	Effect of seed treatment, nursery manuring and methods of phosphate application on yield, content and uptake of nutrieets by IR 20 (*Oryza sativa L*)	P. Ramanathan	Dr. G. V. Kothanda raman
18.	Effect of sulphur on yield and chemical composition of groundnut (*Arachis hypogaea L.*) variety TMV 7 in Periyar Command area	G. Sekhar	Th. C. N. Venkata raman
19.	Effect of heavy doses of organic manures as ameliorants on pysico-chemical properties and yield of finger millet (*Eleusine Coracana Gaertn*) in sodic soils	R. M. Subramanian	Dr. K. K. Krishna moorthy

AGRICULTURAL ENTOMOLOGY

Ph. D

1.	Studies on the relative resistance of sorghum accessions to *Sitaphilus oryzae L.*	K. Asaf Ali	Dr. M. Balasubra manian
2.	Studies on the lesion namatode, *Pratylenchus delattrei* (Luc, 1958) on Crossandra (*Crossandra undulaefolia Salisb*)	Sivagami Vadivelu	Dr. T.S. Muthukrishnan

3.	Studies on the pathogenicity of *Metarhizium anisopliae* (Metschnikoff) Sorokin var. major Tulloch in *Oryctes rhinoceros L.*	P. C. Sundara Babu	Dr. M. Balasubramanian

M. Sc. (Ag.)

1.	Studie on the resistance in cowpea, *Vigna unguiculata L.* Walps, to the aphid, *Aptus craccivera* Koch	R. Charles Bell	Dr. S. Chelliah
2.	Studies on the juvenomimetic and antifeedant activities of *Parthenium hysterophorus L.* (Compositae) on Spodoptera litura F. (Lepidoptera Noctuidae)	G. Gajendran	Dr. M. Gopalan
3.	Studies on pink boll worm of cotton *Pectinophora gossypiella* (Sound) with synthetic sex pheromone gossyplure	P. Karuppuchamy	Dr. M. Balasubramanian
4.	Studies on persistence and dissipation of HCH and Lindane	T. Manoharan	Dr. M. Balasubramanian
5.	Studies on the effect of parental host and insecticides on *Chelonus biackburni* Caneron (Braconidae: Hymenoptera)	V. Manoharan	Dr. M. Balasubramanian
6.	*Xiphinema* (Cobb, 1913) LONGIDORIDAE: DORYLAIMIDA) in Tamil Nadu.	M Mathiyazhagan	Dr. C. V. Sivakumar
7.	Studies on the efficacy of three fumigants in controlling *Sitaphilus oryzae L.* (Coleoptera: Curculionidae) and *Coliosobruchus chinensis L.* (Coleoptera: Bruchidae)	R. Natarajan	Dr. M. Balasubramanian

8.	Studies on the comptability of insecticides, fungicidies and urea.	V. Padmanabhan	Dr. M. Gopalan
9.	Studies on light trap catches under wetland and gardenland systems	P. Sasitharan	Dr. M. Balasubramaniah
10.	Studies on the predatory coccinellids of aphids	V. A. Sugumar	Dr. S. Chelliah
11.	Studies on the ecology and control of the pulse beetle *Callosobruchus chinensis* Linn	G. Alagarsamy	Dr. S. Jayaraj
12.	Studies on the ecology and damage potential of the red spider mite (*Tetranychus cinnabarinus* Boisduval) on the egg plant (*Solanum melongena L.*)	T. R. Amarnath Babu	Dr. S. Uthamasamy
13.	Studies on the effect of chemicals in the control of pests and diseases of chilli with special reference to their compatability and methods of application	N. K. Dakshinamurthy	Dr. S. Jayaraj
14.	Juvenomenietic and antifeedant properties of some plant extracts on *Spodoptera litura F.* (Lepidoptera: Noctuidae)	A. John Britto	Dr. S. Thirumurthi
15.	Studies on the biology and host reference of melonfly peenkin beetles and spotted beetle on some cucurbitceous crops.	C. Kannan	Dr. S. Uthamasamy
16.	Studies on the food plant ecology of *Heliathis, armigera* (Hb.) (*Lepidoptera : Noctuidae*) and its integrated control	A. Vijayakumar	Dr. S. Jayaraj

17. Studies on the integrated control of chilliwhite aphid *Myzus persicae* Sulzer.	P. Vivekanandam	Dr. S. Jayaraj

PLANT PATHOLOGY

Ph. D.

1. Studies on two virus diseases of finger millet. (*Eleusine coracana Gaertn*)	V. Narasimhan	Dr. T. K. Kandaswamy
2. Studies on leaf blight of sesame (*Sesamum indicum L.*) caused by *Alternaria sesami* (Kawamura) MOHANTY AND BEHARA.	S. Natarajan	Dr. N. Shanmugam
3. Studies on benchy top desease of banana.	B. Rajagopalan	Dr. V. Mariappan
4. Studies on oyster mushroom (*Pleurotus sojor - caju* (Ft) Singer.	K. Sevaprakasam	Dr. T. K. Kandaswamy

M. Sc. (Ag.)

1. Studies on powdery mildew of blackgram and greengram caused by *Erysiphe polygoni* DC.	R. Mohamed Sabir Nawaz	Dr. P. Narayana swamy
2. Seedborne pathogens of tomato.	S. Nedumaran	Dr. P. Vidhyasekaran
3. Chemical control of betelvine wilt disease.	B. Ramraj	Dr. P. Vidhyasekaran
4. Studies on angular leaf spot and vein blight of cotton.	Ch. Ravindar Reddy	Dr. T. K. Kandaswami
5. Studies on the interaction of herbicides and granular insecticides with *Rhizoctonia soloni)* KUHN and *Sclerotium rolfsii* SACC.	A. Sankaralingam	Dr. R. Jeyarajan

6.	Studies on mosaic disease of soybean (*Glycine max L.* MERR).	D. Srinivasavaradan	Dr. V. Mariappan
7.	Studies on bactenial leaf blight of rice. (*Oryza sativa L.*) caused by *Xanthomonas oryzae* (UYEDAET ISHIYAMMA) DAWSON.	V. Valluvaparidasan	Dr. V. Mariappan

HORTICULTURE

Ph. D.

1.	Studies on certain aspects of grwoth and development of roots in some banana cultivars.	Nalin kumar Mohan	Dr. V. N. Madhava Rao
2.	Genetic studies in brnijal (*Solanum melongena L.*)	Seemanthini Ramadas	Dr. C. R. Muthu krishnan
3	Studies on the endogenous factors of bearing and non bearing grapevines (*Vitis vinifera L.*)	P. Selvaraj	Dr. K. G. Shanmuga-velu
4.	Studies on certain aspects of growth, flowering and fruit development in 'Robusta' banana.	S. R. Sosangtzudir	Dr. V. N. Madhava Rao
5.	Studies on induced mutations in tomato. (*Lycopersicum esculentum*) (Mili)	R. Subbiah	Dr. C. R. Muthu krishnan
6	Effect of non-cyclic pruning and annual shoot cluster thinning on certain aspects of the physiology of flowering in Mango (*Mangifera indica L.*)	Tekchand Saidha	Dr. V N. Madhava Rao

M. Sc. (Ag.)

1.	Studies on drought resistance of tomato (*Lycopersicum esculentum* Mill.)	L. Babu	Dr. C. R. Muthu krishnan

2.	Line x tester analysis in chilli (*Capsicum annum L.*)	P. Balakrishnan	Dr. C. R. Muthu krishnan
3.	Growth and development of papaya (*Carica papaya L.*) CV. Co2 as influenced by soil moisture levels.	S. Balasubramanyam	Dr. V. N. Madhava Rao
4.	Nutritional requirements in nendran banana (French Plantain - AAB)	K. Bhavanishankar	Dr. V. N. Madhava Rao
5.	Studies on the uptake of nutrients, growth and development of Musa (AAA group, Cavendish subgroup) 'Robusta' as influenced by parasitic nematodes.	C Chennadurai	Dr. V. N. Madhava Rao
6.	Evaluation of papaya types for yield and quality of pappain.	S Irulappan	Dr V. N. Madhava Rao
7.	Evaluation of intervarietal crosses of Bhendi (*Abel moschus esculentus* (L- Moench)	K. Palanivelucamyh	Dr. C.R. Muthukrishnan
8.	Studies on the nutrient requirements of French beans *Phaseolus vulgaris L.*)	K. R. Panneerselvam	Dr. K. G. Shanmuga velu
9.	Studies on the effect of nitrogen and potassium on the growth and development of colocasia (*Colocasia esculenta L.* Schoh.)	S. Premraj	Dr K. G. Shanmuga velu
10.	Studies on intercropping and plant density in Dwarf Cavendish banana.	A. Ravikumar	Dr. V. N. Madhava Rao
11.	Studies on the effect of different levels of nitrogen, phosphorus and potassium on Co 3 Onion (*Allium-cepa* L. var. *aggregatum*)	S. Robert Vincent	Dr. K. G, Shanmuga velu

12. Studies on the effect of different sizes of setts and methods of raising on growth and yield of Co 1 Tapioca (*Manihot esculenta* Cranty.)	G. Sampath	Dr. K. G. Shanmuga velu
13. Studies on the effect of different types of soil and water on the growth and development of Bhendi (*Abelmoschus esculentus L. Moench*)	S. Sampathkumar	Dr K. G Shanmuga velu
14. Studies on the effect of sugar factory distillery effluent on the growth and yield of Co 3 Onion (*Allium cepa L. var. aggregatum*)	L. A. Sivarama krishnan	Dr. K. G. Shanmuga velu
15. Studies on growth and development of certain types of Amaranthus (*Amaranthus sp. L*)	M. Vijayakumar	Dr. K. G. Shanmuga velu

SEED TECHNOLOGY

M.Sc. (Ag.)

1. Studies on the development, maturation and storage of seeds in Ashgourd *(Benincasa hispida (THUNB) COGN)* Co 1	S. Krishna Prasad	Th. V. Ramakrishnan
2. Seed storage studies in paddy cultviars (*Oryza sativa L.*)	M. Sekar	Th. C. Dharmalingam
3. Studies on seed development, matuation and storage in horsegram (*Dolichos biflorus L*)	I. V. Ramana Reddy	Dr. K. R. Ramaswamy
4. Studies on seed viability and vigour in South Indian millets.	D. Reuben Suriyakumar	Dr. K R. Ramaswamy

AGRICULTURAL ECONOMICS

Ph.D.

	Title	Student	Guide
1.	A system simulation approach for an economic appraisal of agricultural development in Polur Panchayat Union, North Arcot District, Tamil Nadu.	V. Meenakshi sundaram	Dr. P. K. Aiyasamy
2.	Pattern of water application use and management in Lower Bhavani Project, Coimbatore district, Tamil Nadu	K. Palanisami	Dr. S. R. Subramanian
3.	Demand for fertilizers at farm level in Tamil Nadu-An economic analysis.	P. Zeaudeen	Dr. V. Rajagopalan

M.Sc. (Ag.)

	Title	Student	Guide
1.	A study of income and employment of rural households in Vadugapatty Block, Madurai District, Tamil Nadu	A. Arunkumar	Dr V. Rajagopalan
2.	Benefit analysis of regional rural banks to weaker setions - A study in Sattur Block	S. Balaji	Dr. S. R. Subramanian
3.	Marketed surplus of rice and its determinants in Madurai District - An economic analysis	R. Chandrasekaran	Dr. P. K. Aiyasamy
4.	The impact of production credit on income, employment and technology of small farmers in Bhuvanagiri Block, South Arcot District	P. Ilango	Dr. P. K. Aiyasamy

5.	Impact of tractorisation on income and employment in Bhuvanagiri Block, South Arcot District	J. Kubendran	Dr. S. R. Subramanian
6.	An economic appraisal of sericulture enterprise in Salem Taluk	M. Manoharan	Dr. S. R. Subramanian
7.	Resource use efficiency in Nepalese agriculture - A comparative study of agriculturally developed and less developed regions	S. K. Poudel	Dr. V. Rajagopalan
8.	A study of market, market structure and marketing of prawn in Mandapam Block, Ramanathapuram District	M. Rajendran	Dr. S. R. Subramanian
9.	A study on cost and returns of dairy units of Tamil Nadu Agricultural University	K. Ramalingam	Dr. P.K. Aiyasamy
10.	Constraints to Agricultural production - A village level study	S. Sukumar	Dr. S. R. Subramanian
11.	A study on spatial and temporal variation in prices and marketing of groundnut in North Arcot District	P. Sundaram	Dr. S. R. Subramanian
12.	Impact of urbanisation on employment, wage rate and income of agricultural labour	M Thanasekaran	Dr. S. R. Subramanian
13.	A study on employment, income and expenditure pattern of landless agricultural labourers and rural artisans in Tiruparankundram Block, Madurai District	P. V. Vaidialingam	Dr. P. K. Aiyasamy

MICROBIOLOCY

M.Sc.

1. *Rhizobium* - Blackgram symbiosis as influenced by certain environmental factors	A. David Ravindran	Dr. M. Rangarajan
2. Studies on biological nitrogen fixation in certain forage legmes, fodder grasses and grass - legume mixtures	T. Elango	Dr. G. Oblisami
3. Effect of press mud and filter mud on microbial activities of soil in relation to certain crop plants	G. Gunaseelan	Dr. D Kandasamy
4. Microbial digestion of organic wastes for energy	A. Palanisamy	Dr. P. Rajasekaran
5. Microbiological utilisation of cellulostic wastes for single cell protein production	K. Rajkumar	Dr. D Purus hothaman

AGRICULTURAL EXTENSION AND RURAL SOCIOLOGY

M Sc.(Ag)

1. Spatial distribution of poultry farms facilities offered by Tamil Nadu Poultry Development Corporation	G. Ayyadurai	Dr. A. John knight
2. Adoption of dairy innovations - A critical analysis	R. Balasubramanian	Dr. A. John knight
3. A study on the impact of integrated dryland agricultural development project (IDADP) on groundnut growers	S. R. A. Balu	Dr. A. John knight
4. Source utilisation and problems of former beneficiaries of a Nationalised Bank	Ismil Mohamed Iqbal	Dr. A. John knight

5.	An analysis of factors responseble for the participation and non - participation of cotton growers in regulated markets	N. Jayavelu	Dr. A. John knight
6.	The credit seeking, repayment utilisation pattern and information need perception of borrowers	S. Kailasam	Dr. A. John knight
7.	Study of awareness, attitude, aptitude and adoption of farmers towards cross - bred dairy animals	B. Katherkhan	Dr. A. John knight
8.	Critical analysis of factors associated with particition and non-participation of turmeric growers in regulated market	K. C. Mani	Dr. A. John knight
9.	A study on the knowledge and extent of adoption of sunflower growers	N. Manivannan	Dr. A. John knight
10.	A critical analysis of the factors influencing the use of regulated market	T. K. Manoharan	Dr. A. John knight
11.	Critical analysis of the functioning of drought prone area programme	A. C. Kandakumar	Dr. A. John knight
12.	Communication problems and prospects of small farmers	V. A. Rajendran	Dr. A. John knight
13.	Impact of Krishi Vigyan Kendra on trained farmers	Ch. Ramakrishnan	Dr A. John knight
14.	A. study on attitude extent of adoption and problems encountered by registered sugarcane growers	V. Ravichandran	Dr. A. John knight

SOIL AND WATER CONSERVATION

M.E. (Ag).

1.	Study of effective rainfall for irrigated cotton under coimbatore condition	V. Rajakrishna moorthy	Dr. D. Chandrasekaran

ANIMAL GENETICS AND BREEDING

Ph.D

1.	Genetic effects influencing broiler traits estimated from diallel mating systems	V. Ulaganathan	Dr. Rathnasabapathy

M.V.Sc

1.	Deep freezing of ram semen	J. Kalatharan	Dr. B.M. Easwaran
2.	Effect of potassium and sodium concentration on quality and freezability of buffalo semen	P. Kanakaraj	Dr. U.S Krishnamurthy
3	Studies on the mobility and freezability of murrah buffalo semen in relation to its D.N.A. content	B. Seetharam Singh	Dr. U.S. Krishnamurthy

DAIRY SCIENCE

M.V.Sc.

1.	Studies on coli mastitis	R. Sankararaman	Dr. P.S Krishnamurthy
2.	Sanitation of the farm dairy equipment - milk cans	S Syed Gaffar	Dr. P.S. Krishnamurthy

MEATS

M.V.Sc.

1.	Studies an the keeping quality of frozen soups in polyethlene bags	N. Devanathan	Dr. C.V. Govindarajan
2.	Studies an the preparation of canned corned beef	K. Harikrishnan	Dr. V.R. Kosalaraman

3.	Studies on the biochemical architecture of chevon	T. Palanichamy	Dr. C.V. Govindarajan
4.	Trends in consumption of various meats in Madras city	D. Subramanya Reddi	Dr. V.R. Kosalaraman
5.	The decontamination efficiency of chlorinated water spray washing on sheep and goat carcass surfaces	G. Thulasi	Dr. V.R. Kosalaraman

VETERINARY PATHOLOGY

M.V.Sc.

1.	Pathology of Ehrilichiosis in canines	B. Muralimanohar	Dr. R. Ramakrishnan

POULTRY SCIENCE

Ph.D

1.	Safflower seed meal as protein supplement in poultry rations	A. Gabriel Raj	P. Kothandaraman

M.V.Sc

1.	Study in hatchability of chicken eggs as related to storage conditions	Abdul Mujeer	Dr. V. Sethumadhavan
2.	Studies on the quality of eggs marketed in the city of Madras	S Balasubramanian	Dr. V. Sethu madhavan
3.	Profitable utilisation of white leghorn male chicks for meat	Faruque Raha mathullah Sheriff	Dr. V. Sethu madhavan
4.	Influence of polyphates on the meat quality and shelf life of ready - to - cook commercial broilers	B. Gopal Ghoushik	Dr. V. Sethumadhavan
5.	Studies on the economic traits and their inter relationship in white leghorn pullets	K. Venugopal	Dr. V. Sethumhdhavan

VETERINARY MICROBIOLOGY

M.V.Sc.

1.	Studies on conglutinin and immuno - conglutinin in canines	N. Dorairajan	V.D. Padmanaban
2.	Electrophoretic analysis of serum proteins of dogs in health and disease	V. Hariharan	R.A. Balaprakasam
3.	Adaptation of 'komarov' strain of ranikhet disease virus to pig kidney cell culture	B. Pankajam	M.S. Jayaraman
4.	Studies on immunity against fowl pox	T. G. Prabhakar	R.A. Balaprakasam
5.	Isolation of Solmonellae from animal products and their antibiogram	V. Purushothaman	M.S. Jayaraman
6.	Comparative evaluation of certain diagnostic techniques for diagnosis of rinderpest	R. Selvakumar	R.A, Balaprakasam

OBSTETRICS AND GYNAECOLOGY

M.V.Sc

1.	Studies on involution of uterus in the murrah buffaloes	Augustine Thomas Peter	Dr. K.S. Narasimhan
2.	Studies an cloprostenol treatment for Angestrem in buffaloes(*Bubalus bubalis*)	B. Neduncheralathan	Dr. K.S. Narasimhan

PREVENTITE MEDICINE

M.V.Sc.

1.	Survey on the incidence of rabies in bandicoots in Madras city by fluorescent antibody technique	A. Manicavasaka dinakaran	Dr. N. Raghavan

2. Serological survery of Q fever among sheep	P. Ramakrishnan	Dr. T.G. Abdulkhader

THERAPEUTICS

M.V.Sc.

1. A study on the cerebrospinal fluid pressure-A measure of Avitaminosis in calves	P Dhanapalan	Dr. V.V. Nagarajan
2. Volatile fatty acid concentration in the ruminal contents in primary indigestion of ruminants	M. Kandasami	Dr V.V. Nagarajan
3. A Study on the keeping quality of bovine blood in citrate phosphate-dexture medium and its suitability for blood transfusion	C. Pazhaniyandi Pillai	Dr. V.V Nagarajan
4. A study on the techniques for assessment of microbial status in ruminal fluid in lactating cows in primary indigestion	Samuel Vijayasekar Muthiah	Dr. V.V. Nagarajan

AGRSOTOLOGY

M.Sc. (Ag)

1 Biometrical studies insome new bajra-napier hybrids	C.R. Balagopal	Dr. P. Chandrasekaran
2 Biometrical studies on genetic divergence in Dinanath grass *(Pennisetum pedicellatum Trin)*	V. Daniel Das Sekar	Dr. P. Chandrasekaran
3. An investigation on induced mutagenesis in (*Brachiaria ramosa* (L) Stapt	S. Lakshmiraj	Dr. M. Balasubramanian

THE multifaceted progress during 1980 - 81 was achieved with the whole-hearted support of the Chancellor, the Pro-Chancellor, the Chief Secretary and Secretaries to the State and Central Governments and several other officials of the Government, which the University gratefully acknowledges. The guidance from the members of the Statutory Bodies of the University, namely, Board of Management, Academic Council Research Council and Extension Education Council helped in accelerating the processes of development and in identifying new horizons of thought and action.

The University wishes to record its thanks to the Indian Council of Agricultural Research, New Delhi for the liberal grants given for the various developmental programmes including the building works and equipments purchase in Coimbatore, Madurai, Madras and Tuticorin campuses and other research centres and also for the continued support for the research work carried out all over the State. Thanks are also due to GOI, UGC, DST, CSIR, DES, CGWP, AFPRO, New Delhi, UNDP, UNICEF, FAO, IAEA, SIDA, Ford Foundation PL-480, USDA, Soil Health Foundation, USA, GDR South India Viscose, Seshasayee Paper Boards ICMF, Bombay, Tamil Nadu Small Scale Pesticides Manufacturers Association and Stanes & Co., Coimbatore for financial grants given for undertaking research work in the University. Various private industries and institutions within the country have given financial assistance for undertaking research in specific areas of current importance.

It is pleasure to acknowledge the help and co-operation received from the officers, teachers, scientists, students and technicians administrative and supporting staff who have helped in succesful running of the University. All of them worked with devotion, dedication and team spirit. The farming community of Tamil Nadu the general public and the agro-industrialists evinced keen interest in the activities of the University and this inspired reorientation of the University's activities to meet the emerging needs of the clientele. The University requests the people of the State and country and the authorities at various levels for continued support and help to build it as a Centre of Excellence in Agricultural Education, Research and Training.